RAILROAD GAZETTE

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RAILROAD GAZETTE DIRECTORY

Air Brake Fittings
Stanley G. Flagg & Co., Phila.
Air Brake Hose
N.Y. Belting & Pack. Co., Ltd., 15 Park Row.
Air Brake Regulator
Mason Regulator Co., Boston.
Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10 Park Place, N. Y.
Rand Drill Co., 23 Park Place, N. Y.
Architect
Bradford L. Gilbert, 30 Broadway, N. Y.
Thomas Appleton, 505 Rialto Bldg., Chic.
Architectural Iron Work
King Bridge Co., Cleveland, O.
Asbestos Packing
H. W. Johns Mfg. Co., N. Y. City.
Asphalt Pavement
Wehn Pavement Co., 16 Exch. Pl., N. Y.
Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima, O.
Louisville Steam Forge Co., Louisv., Ky.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Nicetown, Phila.
Pittsb'gh Forge & Iron Co., Pittsb., Pa.
T. Prosser & Son, 15 Gold St., N. Y.
Balanced Slide Valves
C. Hammond, Troy, N. Y.
Ballast Unloaders
Marion Steam Shovel Co., Marion, O.
Bankers
Brown Bros. & Co., 59 Wall street, N. Y.
Bell Cord & Coupling
Samson Cordage Works, Boston, Mass.
Boilers
Aberdeen & Root Mfg. Co., Cliff St., N. Y.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Rich. Loco. & Mach. Co., Richmond, Va.
Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.
Wellman Iron & Steel Co., Thurlow, Pa.
Bolt Cutters
Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N. Y.
Bolts & Nuts
Fuller Bros. & Co., 439 Greenwich St., N. Y.
Rhode Island Tool Co., Providence.
Books & Publications
E. & F. N. Spon & Co., 12 Cortlandt St., N. Y.
John C. Trautwine, Jr.
Brake Adjusters
Hinckley Brake Co., Trenton, N. J.
G. & C. Co., Chicago.
Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.
Brakes
Boyden Brake Co., Baltimore, Md.
Westinghouse Air Brake Co., Pittsb., Pa.
Brake-Shoes
Congdon Brake-Shoe Co., Chicago, Ill.
Ramapo (N. Y.) Wheel & Foundry Co.
Bridges
Anderson & Barr, Jersey City, N. J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Cofrode & Saylor, Philadelphia, Pa.
Detroit Bridge & Iron Wks, Det., Mich.
Edge Moor Bridge Wks, Wilmington, Del.
Elmira Bridge Co., Elmira, N. Y.
S. W. Fresco in, World Bldg., N. Y.
Keystone Bridge Co., Pittsburgh, Pa.
King Bridge Co., Cleveland, O.
Louisville Bridge & Iron Co., Louisv., Ky.
Mo. Val. Br. & Ir. Wks., Leavenw., Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N. J.
Phoenixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co., 1165 Ewings Bldg., Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & Ir. W'k's, Rochester
A. & P. Roberts & Co., Philadelphia, Pa.
San Francisco Bridge Co., California.
Shelton & Schneider, Chicago, Ill.
Shiffler Bridge Co., Pittsburgh, Pa.
Scobmith & Co., 2 Nassau street, N. Y.
Union Bridge Co., 18 Broadway, N. Y.
J. A. L. Waddell, Kansas City, Mo.
Wrought Iron Bridge Co., Canton, O.
Youngstown (Ohio) Bridge Co.
Bridge Machinery
Vulcan Iron Works, Chicago.
Bridge Timbers
McGregor Meglary, Cincinnati, O.
Building
Berlin Iron Bridge Co., E. Berlin, Conn.
Bulldozers
Williams, White & Co., Moline, Ill.
Cars
Allison Mfg. Co., Philadelphia, Pa.
Bloomsburg Car Co., Bloomsburg, Pa.
Osgood Bradley & Sons, Worcester, Mass.
J. G. Brill & Co., Philadelphia, Pa.
Canda Mfg. Co., 118 S. 6th St., N. Y.
Reginald Canning & Co., 115 B'way, N. Y.
Ensley Mfg. Co., Bessemer, West Va.
Erie Car Works, Limited, Erie, Pa.
Harvey Steel Car Co., Chicago, Ill.
Jackson & Sharp Co., Wilmington, Del.
Jackson & Woodin Mfg. Co., Berwick, Pa.
A. S. Males & Co., Cincinnati.
Middletown Car Works, Middletown, Pa.
N. Y. Equipment Co., 15 Wall St., N. Y.
H. C. Orphardt, Camden, N. J.
Pullman Car & Mach. Wks, Watson & Pa.
Portland Co., Portland, Me.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngstown (Ohio) Car Mfg. Co.
Cars, Second Hand
Reginald Canning & Co., 115 B'way, N. Y.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Car Couplings
Auto. Interchangeable Car Coupler Co., San Francisco, Cal.
Buckeye Ant. Car Coup. Co., Columbus, O.
Drexel Car Couplers Co., Rookery, Chicago.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
Johnston Car Coupling Co., Phila., Pa.
McConway & Torley Co., Pittsburgh, Pa.
McGill Iron Works Co., Peoria, Ill.
Pratt & Letchworth, Buffalo, N. Y.
St. Louis Car Coupler Co., St. Louis, Mo.
Sheffield Coupler & Mfg. Co., Hartford, N. J.
The Standard Car Coup. Co., Troy, N. Y.
Trojan Car Coupler Co., Troy, N. Y.
Van Dorston Coup. Co., Phila., Pa.
Car Doors
Amer. Car Door Co., Indianap., Ind.
Q. & C. Co., Chicago, Ill.
Wagner Car Door Co., Indianap., Ind.
Car Heaters
William C. Baker, 199 Greenwich St., N. Y.
Consol. Car Heating Co., Albany, N. Y.
Gold Car Heat. Co., Frankfort St., N. Y.
Martin A. F. Car Heat. Co., Dunkirk, N. Y.
Morgan Safety Heating Co., N. Y.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat & Light Co., 160 B'way, N. Y.
Car Heating Equipment
Stanley G. Flagg & Co., Philadelphia.
Car Machinery
Greenlee Bros. & Co., Chicago.
Car Platform Gates
J. B. Goodwin, 20 B'way, N. Y.
Car Plushes
Sanford Mills, 120 Washington St., Boston.
Car Replacers
Q. & C. Co., Chicago.
Car Roofing
Drake & Wells, Cleveland, O.
C. B. Hutchin's Sons, Detroit.
Lee Composite Mfg. Co., New York.
Car Seals
Buffalo Seal & Press Co., Buffalo, N. Y.
Hartford Woven Wire Mattress Co., Hartford, Conn.
Hale & Kilburn Mfg. Co., Phila.
Car Upholstering
Knitted Mattress Co., Canton Jct., Mass.
Car Wheel Cranes
Tinius Olsen & Co., Philadelphia, Pa.
Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N. Y. City.
Baltimore Car Wheel Co., Balto., Md.
Barnum & Richardson Mfg. Co., Chicago
Bowler & Co., Cleveland.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Davenport & Fairbairn, Erie, Pa.
Dickson Car Wheel Co., Houston, Tex.
C. G. Eckstein & Co., 32 Liberty St. N.Y.
Jersey City Wheel Fd'y & Mach. Works, Lima Machine Works, Lima, O.
Lobdell Car Wheel Co., Wilmington, Del.
Louis. Car Wheel Co., Louisville, Ky.
St. Louis Wheel Works, Buffalo.
Penna. Steel & Iron, 15 Gold street, N. Y.
Ramapo Wheel & F'dry Co., Ramapo, N. Y.
Standard Steel Works, 220 So. 4th St., Phila.
Taylor Iron & Steel Co., High Bridge, N. J.
Washburn Car Wheel Co., Hartf'd, Conn.
Wason Mfg. Co., Springfield, Mass.
Whitney & Sons, Philadelphia, Pa.
Car Window Balance
H. H. Gardner, Box 111, Pittsburgh, Pa.
Cattle Guards
Bush Cattle Guard Co., Kalamazoo, Mich
Kalamazoo R. R. Veloc. & Car Co., Kalamazoo, Mich.
Newspapers—Benj., 39-43 Washington St., Chicago, Ill.
Chemists
Pittsb. Testing Laboratory, Pittsb., Pa.
Coal Chute
Williams, White & Co., Moline, Ill.
Coal Transferring
W. Hunt Co., 45 Broadway, New York.
Consulting Engineers
Thomas Appleton, 505 Rialto Bldg., Chic.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Frescoln, World Bldg., N. Y.
Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
Pittsb. Test. Laboratory, Pittsb., Pa.
F. H. Smith, 227 E. German St., Balto., Md.
E. N. K. Talcott, 57 Broadway, N. Y.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Consulting Electrical Engineers
Sprague, Duncan & Hutchinson, N. Y.
Conveyors
Link Belt Eng. Co., Nicetown, Phila.
Copper
Hendricks Bros., 49 Cliff street, N. Y.
Cordage
Samson Cordage Works, Boston, Mass.
Cranes
Industrial Works, Bay City, Mich.
John M. Goage, Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg. Co., Stamford, Conn.
Creosoting
Creosote Lumber & Construction Co. Pensacola, Fla.
Lehigh Valley Creo. W'ks, P. Amboy, N. J.
Crossings
Pantine Crossing Co., Detroit, Mich.
Crossing Gates
Boggs & Mills Mfg. Co., Chicago.
Culvert Pipe
Blickensderfer & Post, St. Louis, Mo.
Draft Rigging
Schoen Mfg. Co., Pittsburgh, Pa.
Drawbar Attachment
Amer. Coupl. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N. Y. City.
Butler Drawbar Attach. Co., Cleveland.
Hinson Drawbar Attach. Co., Chicago.
Dredging Machinery
Bucyrus (O.) Steam Shovel & Dredge Co.
San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago.
Drop Forgings
Billings & Spencer Co., Hartford, Conn.
Electric Crossing Signal
Electric Supply & Mfg. Co., Cleve'd, O.
Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.
Elevators
Link Belt Eng. Co., Nicetown, Phila.
Emery Wheels
N.Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Northampton Emery W. Co., Leeds, Mass.
Tanite Co., Stroudsburg, Pa.
Engineering Employment Bureau
Engineer, Employm't Bureau, 8 Granger Block, Syracuse, N. Y.
Engineering Instruments
Chas. H. Brightly, Philadelphia, Pa.
Keller & Brightly Philadelphia, Pa.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Keuffel & Esser, New York City.
Queen & Co., Philadelphia Pa.
Young & Sons, Philadelphia, Pa.
Engineers
Thomas Appleton, 505 Rialto Bldg., Chic.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Frescoln, World Bldg., N. Y.
Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
Pittsb. Test. Laboratory, Pittsb., Pa.
F. H. Smith, 227 E. German St., Balto. Md.
E. N. K. Talcott, 57 Broadway, N. Y.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Engines
Fishkill Landing Mch. Co., Fishkill, N. Y.
Philadelphia Engineering Wks., Phila.
Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.
Explosives
Rendrock Powd. Co., 23 Park Place, N. Y
Feed-Water Purifier
Field Water Purifier Co., Chicago.
Fences
Barkly & House, Chicago, Ill.
Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Fluoride
Amer. Fluoride Co., 126 Liberty St., N. Y.
Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.
Freight Conveyors
Industrial Works, Bay City, Mich.
Forges
The Foos Mfg. Co., Springfield, O.
Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
Cleveland (O.) Frog & Crossing Co.
Elliott Frog & Swr. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Hillburn, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.
Furnaces
Abendroth & Root M.Co., 28 Cliff St., N. Y.
Gauges (Pressure)
Ashcroft Mfg. Co., 111 Liberty St., N. Y.
Grader, Ditcher & R. R. Builder
F. C. Austin Mfg. Co., Chicago, Ill.
Guarantee Co.
Guarantee Co. of N. A., Montreal.
Hand Cars
The Buda Fdy & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Sheffield Velocipede Car Co., Three Rivers, Mich.
Harbor Works
S. W. Frescoln, World Bldg., N. Y.
Highway Crossing Signals
Electric Supply & Mfg. Co., Cleve'd, O
Hoisting & Conveying Machinery
Brown Hoisting & Conveying Mach. Co., Cleveland, O.
C.W. Hunt Co., 45 B'way, New York.
King Bridge Co, Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty S.t., N.Y
Link Belt Machinery Co., Chicago, Ill.
Hoisting Engines
Copeland & Bacon, New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y
J. S. Mundy, Newark, N. J.
Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.
Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N. Y
Joseph F. McCoy Co., 25 Warren St., N. Y
Watson & Stillman, 210 E. 43d St., N. Y
Hydraulic Machinery
Tinius Olsen & Co., Philadelphia, Pa.
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.
Injectors
Nathan Mfg. Co., 94 Liberty street, N. Y.
Wm. Sellers & Co., Philadelphia.
Inspectors
Pittsb. Test. Laboratory, Pittsb., Pa.
Inspectors of Bridges and Ry. Equipment
R. W. Hildreth & Co., 2 Wall St., N. Y.
Insurance
Hart. S. Boiler Insp. & Ins. Co., Hartford
Royal Ins. Co., 30 Wall street, N. Y.
Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Hall Signal Co., 30 B'way, N. Y.
Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh.
Wharton R. R. Switch Co., Phila.
Iron—Taylor Yorkshire
B. M. Jones & Co., Boston, Mass.
Iron Work for Contractors
Edge Moor Bridge Wks, Wilmington, Del.
King Bridge Co., Cleveland, O.
Iron & Steel Ship Builders
Union Iron Works, San Francisco.
Jacks
Fairbanks, Morse & Co., Chicago.
McSherry Mfg. Co., Dayton, O.
Richard Dudgeon, 24 Columbia St., N. Y
Watson & Stillman, 210 E. 43d St., N. Y.
Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
D. A. Hopkins Mfg. Co., 143 Liberty St. N. Y.
Phosphor-Bronze Smelting Co., Philada.
Paul S. Reeves, Philadelphia, Pa.
Journal Bearings—Tubular
Meneely Bearing Co., W. Troy, N. Y.
Journal-Box Lids
Ramapo (N. Y.) Wheel & F'dry Co.
Lighting
Adams & Westlake Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light. Co., 160 B'way,
Link Belting
Link Belt Eng. Co., Nicetown, Phila.
Lock Washers
Nat. Lock Washer Co., Newark N. J.
Locomotives
Baldwin Locomotive Works, Philada.
Brooks Locomotive W'ks, Dunkirk, N. Y.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS

Locomotives (Continued)
Cooke Loco. & Mach. Co., Paterson, N.J.
Dickson Mfg. Co., Scranton, Pa.
G. L. Fowler, 53 Broadway, N. Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pittsburgh Loco. & Car W'k's, Pittsburgh, Pa.
H. K. Porter & Co., Pittsburgh, Pa.
Portland Co., Portland, Me.
Richmond (Va.) Loco. & Mach. Works.
Rogers Loc. & Mach. Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Taite & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.

Locomotive Boiler Tubes.
Allison Mfg. Co., Philadelphia, Pa.

Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.

Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.

Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.

Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Lubricators
Detroit Lubricator Co., Detroit, Mich.
Nathan Mfg. Co., 92 Liberty street, N. Y.

Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ferracute Machine Co., Bridgeton, N. J.
Gould & Eberhardt, Newark, N. J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Long & Allstatter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St.
Morse Tw. Dr. & Mach. Co., N. Bed'd, Mass.
Newark Mach. Tool Wks., Newark, N. J.
Niles Tools Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia.
Stiles & Parker Press Co., Middletown, Conn.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Universal Radial Drill Co., Cincinnati.
Watson & Stillman, 210 E. 45d St., N. Y.
Wharton R. R. Switch Co., Phila.

Malleable Iron Castings.
National Malleable Castings Co., Cleveland.

Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Mining Machinery
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Union Iron Works, San Francisco.

Nut Locks
Amer. Washer & Mfg. Co., Newark, N. J.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N. Y.

Oil
Signal Oil Works, Ltd., Franklin, Pa.

Oil Cans
Adams & Westlake Co., Chicago.

Ore Handling Machinery.
King Bridge Co., Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.

Packing, Asbestos
H. W. Johns Mfg. Co., N. Y. City.

Packing, Metallic
U. S. Metallic Packing Co., Phila.

Packing, Rubber
N.Y. Belt & Pack. Co., Ltd., 15 Park Row.

Paint
Andress Paint & Color Co., 15 Cortlandt street, N. Y.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N.J.
Nat. Paint Works, Williamsport, Pa.
Standard Paint Co., 2 Liberty St., N. Y.

Patents
W. Dudley & Co., Washington, D. C.
S. C. Fitzgerald, Washington, D. C.
Howson & Howson, 119 So. 4th St., Phila.
Geo. P. Whittlesey, Washington, D. C.

Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.

Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Vulcan Iron Works, Chicago, Ill.

Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.

Pneumatic Foundations
S. W. Frescolin, World Bldg., N. Y.

Portable Drills
Jas. T. Halsey, Philadelphia, Pa.
Frank Reed, Worcester, Mass.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.

Pumps
Fairbanks, Morse & Co., Chicago.
Laidlaw & Dunn Co., Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 86 Liberty St., N. Y.

Radial Taps
J. T. Connelly, Milton, Pa.

Rails
Bethlehem Iron Co., 80 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh, Pa.
A. S. Whiton, 115 Broadway, N. Y.

Rail Fastenings
Cambria Iron Co., Johnstown, Pa.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.

Rail Joints
Cont. Rail Joint Co. of Amer., New'k, N.
Eno Rail Joint Co., Newark, N. J.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
McConway & Torley Co., Pittsburgh, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Q. & C. Co., Chicago, Ill.

Railroad and Transp. Lines
Big Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.
Chicago, Rock Isl. & Pacific.
C., H. & D.
Hoosac Tunnel Route.
Illinois Central.
Lehigh Valley R. R.
Michigan Central.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Stonington Line.

Railroad Printing
C. F. Ketcham & Co., 27 Nassau St., N. Y.

Railroads, Building & Equipping
L. Breckinridge Cabell, 18 B'way, N. Y.

Railroad Supplies
Bryant & Barbey, 79 Milk St., Boston.
Reginald Canning & Co., 115 B'way, N.Y.
Fairbanks, Morse & Co., Chicago.
E. S. Greeley & Co., 7 Dey St., N. Y.
The Johnson R. R. Signal Co., Rahway, N. J.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
G. D. Peters & Co., London, England.
A. T. Shoemaker, Chicago and N. Y.

Rail Saws
Bryant & Barbey, 178 Summer St., Boston.

Railway Varnishes & Surfacers
Flood & Conklin, Newark, N. J.

Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Schuttler Mfg. Co., Chicago.

Reducing Valves
Curtis Regul. Co., 89 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.

Refined Iron
Falls Hollow Staybolt Co.

Refrigerator Cars
R. M. Pancoast, Camden, N. J.
So. & Pac. Refrigerator Car Co., Chicago.

Refrigerating Machinery
De La Vergne Refrig. Machine Co., N. Y.

Rivets, Slotted
J. A. Thomson Mfg. Co., Waltham, Mass.

Road Scrapers
Amer. Steel Scraper Co., Sidney, O.

Rock Ballast and Rock Breakers
Gates Iron Works, Chicago, Ill.

Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 23 Park Place, New York.

Rolling Steel Shutters
Jas. G. Wilson, 74 W. 23d St., New York.

Roofing
East. Gran. Roofing Co., Jersey City, N.J.

Roofs
Berlin Iron Bridge Co., E. Berlin, Conn.
King Bridge Co., Cleveland, O.

Rolling Journal Bearings
Metcalf Bearing Co., W. Troy, N. Y.

Rolling Stock to Lease
Oliver Adams, 32 Liberty St., N. Y.

Rubber Belting
N.Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Peerless Rubber Co., 15 Warren St.

Safety Valves
Ashton Valve Co., Boston, Mass.

Saw Mills
Richmond (Va.) Loco. & Mach. Wks.

Schools, Technical
Rensselaer Polytechnic Inst., Troy, N.Y.

Second-Hand Rolling Stock
A. S. Males & Co., Cincinnati.

Sewerage
J. J. R. Croes, 13 William St., N. Y.

Sewer Pipe
Blackmer & Post, St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Shafting
Wm. Sellers & Co., Phila.

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Hall Signal Co., 50 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.
Kinsman R'k System Co., 143 Liberty St.
Mercer Safety Signal Co., Galion, O.
Nat. Switch & Sig. Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh.

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[illegible]ung, 309 No. 8th Shore, Md.

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[illegible] Brooklyn.

Soft Iron
[illegible] New Jersey Co., Cuyahoga Falls, O.

Speed Recorders
[illegible] Speed Recorder Co., Chicago.

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Q. & C. Co., Chicago, Ill.
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A. French Spring Co., Pittsburgh, Pa.
Lickering Spring Co., Philadelphia.
Pedrick & Ayer Co., Philadelphia, Pa.

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John O. Pease, Chicago, Ill.
King Bridge Co., Cleveland, O.
Lake Shore Car Co., Grand Rapids, Mich.

Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Fuller Bros. Co., N. Y.
Q. & C. Co., Chicago, Ill.

Steam Coupling
Morse Flex. Steam Joint Co., Louisville, Ky.

Steam Shovels
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.

Steel Car Channels
Cambria Iron Co., Johnstown, Pa.

Steel—Musket's
[illegible] & Co., Oliver Building, Boston.

Steel Castings
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Eureka Ca[illegible]ad's Pa.
Norristo[illegible] Norristown, Pa.
Sharo[illegible] Co., Sharon, Pa.
Sol[illegible]ances O.
[illegible]th, Buffalo, N. Y.

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[illegible] Iron & Steel Co., Coatesville, Pa.
[illegible]man Iron & Steel Co., Thurlow, Pa.

Steel and Steel Tires
[illegible]s Steel Works, Latrobe, Pa.
Midvale Steel Co., Nicetown, Phila.
Thos. Prosser & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.

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Allentown Rolling Mig. Allentown, Pa.
Barnum [illegible] Richmond Mfg. Co., Chicago.
Elliott Frog & Switch Co., Lehigh Gap, Pa.
Johnson R. R. Signal & Switch Co.
Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Sig. Co., So. Bethlehem, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
Rockfield Veloc. Car Co., Three Rivers, Mich.
Union Switch & Sig. Co., Pittsburgh, Pa.
Wharton Frog Co., Cincinnati, O.

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[illegible] Bros., Philadelphia, Pa.

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Manning, Maxwell & Moore, 111 Lib.

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Phila. Testing Laboratory, Philadelphia, Pa.

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Cleveland City Forge & Iron Co., Cleveland, O.

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BURNHAM, WILLIAMS & CO., Philadelphia, Pa., U. S. A.

DESCRIPTION AND METHOD OF OPERATION OF THE VAUCLAIN SYSTEM OF COMPOUND LOCOMOTIVES.

In designing the "Vauclain" or Baldwin system of Compound locomotives, the following results have been sought:

1. To compound an ordinary locomotive with the fewest possible alterations necessary to obtain the greatest efficiency as a compound locomotive.
2. To develop the same amount of power on each side of the locomotive, and avoid the racking of the machinery resulting from uneven distribution of power.
3. To make a locomotive in every respect as efficient as a single-expansion engine of similar weight and type.
4. To insure the least possible difference in the cost of repairs.
5. To attain the utmost simplicity and freedom from complication.
6. To realize the maximum economy of fuel and water.
7. To require the least possible departure from the methods of handling usual with single-expansion locomotives.
8. To permit a train, in case of break-down, to be brought in without unusual delay, when using but one side of the locomotive.
9. To be equally applicable to passenger or freight engines.
10. To withstand the rough usage incidental to ordinary railroad service.

The principal features of construction are as follows:

CYLINDERS.—The cylinders consist of one high-pressure and one low-pressure for each side, the ratio of the volumes being as nearly three to one as the employment of convenient measurements will allow. They are cast in one piece with the valve-chamber and saddle, the cylinders being in the same vertical plane, and as close together as they can be with adequate walls between them. Where the conditions, such as diameter of driving-wheels and type of engine, will allow the high-pressure cylinder is put on top (Fig. 1), but where the wheels are low, the position is reversed (Fig. 2). This latter is the practice with Consolidation and other engines, where the roadway clearances would interfere should the first position be used. The valve-chamber is placed in the cylinder-saddle between the boiler and cylinders. As the construction of this chamber is such that the steam-passages must be rough cored, a bushing, in which the ports are accurately slotted, is turned to a neat fit and forced into the valve-chamber. The ports in the bushing are divided at regular intervals by bridges, as shown in Fig. 3. The valve shown by Fig. 4 is of the hollow-piston type, fitted with cast-iron rings sprung into place after the manner of the ordinary piston-rings. It is a combination of two

FIG. 1.

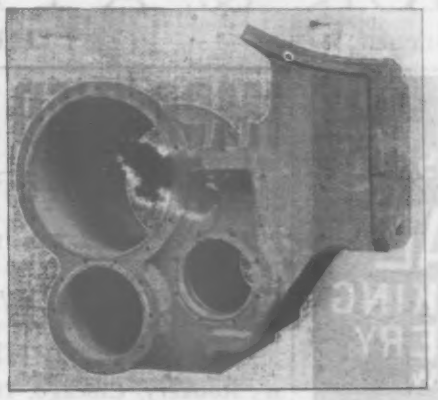

FIG. 2.

FIG. 3.

FIG. 6.

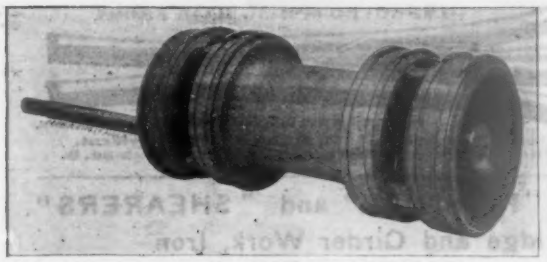

FIG. 4.

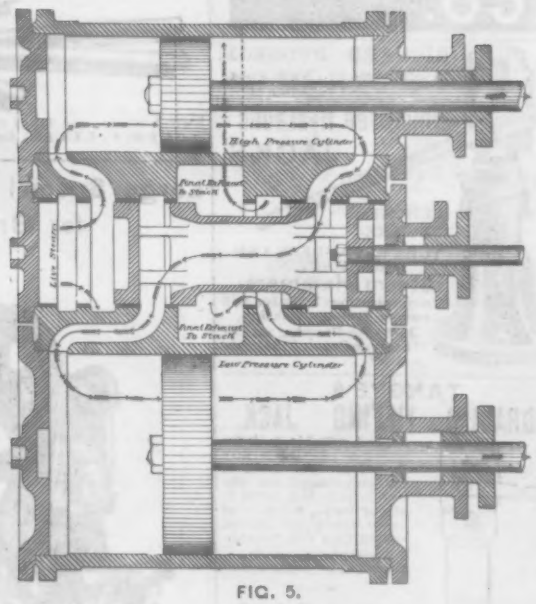

FIG. 5.

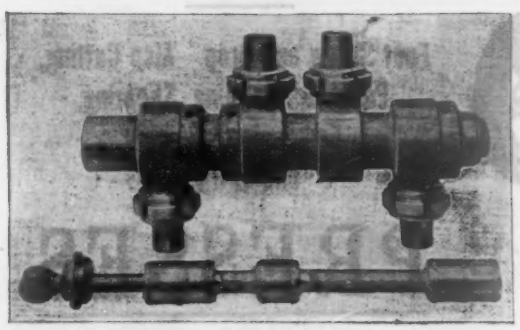

FIG. 8.

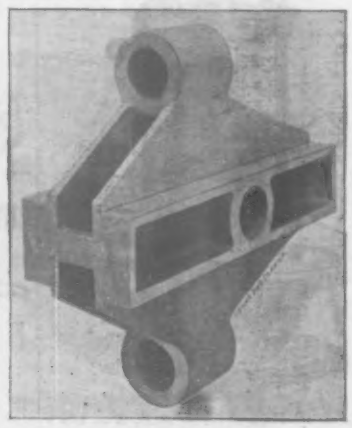

FIG. 7.

D-valves in piston form, the two ends of which control the admission and exhaust of steam to and from the high-pressure cylinder, and the inner rings perform the same functions for the low-pressure cylinder. Its operation will be clearly understood from Fig. 5. When the low-pressure piston is placed on top, the position of the valve is such as to preclude the use of the common rocker-box. Case-hardened crosshead and guides are substituted and operated in direct motion from the links by means of an extension bar. In this manner the wear is reduced to a minimum, and all parts are made easy of access. The pistons are cast in two sections and riveted together. In casting the ordinary hollow piston, the process of coring makes the strength of the casting a matter of chance, since it is impossible to examine more than one side of the casting. By casting it in two pieces (Fig. 6), a piston of less weight and of known strength and quality can be made. Pistons for the largest engines are of such weight as to be easily handled by one man.

The crosshead, which is shown by Fig. 7, is of cast steel of a pattern combining great strength with the least possible metal. The wearing surfaces are covered with block tin one-sixteenth inch thick. The crosshead of the Vauclain system has been the point most frequently criticised, and it is to be remarked that it is the feature that has given the least trouble. The piston-rods are of the same size for both high-pressure and low-pressure pistons. This is to secure uniformity of parts, ease in fitting up, and to make it unnecessary to carry more than one size of piston-rod packing in stock. The low-pressure pistons and rods are so proportioned that in case an excess of pressure is by accident admitted to the low-pressure cylinder, they will withstand the strain with an adequate factor of safety. The combination cylinder cock and by-pass valve (Fig. 8) is designed to take the place of independent cylinder cocks and by-pass valve for each cylinder, so that the whole may be operated by a single lever in the cab. The construction of this valve is such that by a simple movement of the lever, the cylinder cocks may be opened or closed and at the same time admit live steam into the low-pressure cylinder when needed to start a train; or, the cylinder cocks may be closed, the live steam cut off from the low-pressure cylinder, and the engine will be compounding in the most economical manner. The valve consists of a cylinder having a connection to each end of the high and low-pressure cylinders, in which works a plunger with three piston heads fitted with packing rings. These piston heads are so spaced that by a change of their position in the cylinders the desired results described above are obtained. These are the only points of difference between a Vauclain compound and a single-expansion locomotive. The compound is operated the same as an ordinary engine, with the exception of the by-pass or intercepting valve, which is used only in starting to admit high-pressure steam to the low-pressure cylinders.

It is not claimed for compound locomotives that a heavier train can be hauled at a given speed than with a single-expansion engine of similar weight and class. No engine can haul more than its adhesion will allow; but the compound will, at very slow speed on heavy grades, keep a train moving where a single-expansion engine will slip and stall. This is due to the pressure on the crank-pins of the compound being more uniform throughout the stroke than is the case with the single-expansion engine. The principal object in compounding locomotives is to effect fuel economy, and this economy is obtained: 1. By the consumption of a smaller quantity of steam in the cylinders than is necessary for a single-expansion engine doing the same work. 2. The amount of water evaporated in doing the same work being less in the compound, a slower rate of combustion combined with a mild exhaust produces a higher efficiency from the coal burned. In a stationary engine, which does not produce its own steam supply, it is of course proper to measure its efficiency solely by its economical consumption of steam. In an engine of this description the boilers are fired independently, and the draft is formed from causes entirely separate and beyond the control of the escape of steam from the cylinders; hence, any economy shown by the boilers must of necessity be separate and distinct from that which may be effected by the engine itself. In a locomotive, however, the amount of work depends entirely upon the weight on the driving-wheels, the cylinder dimensions being proportioned to this weight; and whether the engine is compound or single-expansion, no larger boiler can be provided, after allowing for the wheels, frames, and other mechanism, than this weight permits. Therefore, the heating surfaces and grate area are practically the same in both types, and the evaporative efficiency of both locomotives is determined by the action of the exhaust, which must be of sufficient intensity in both cases to generate the amount of steam necessary for utilizing, to the best advantage, the weight on the driving-wheels. This is a feature that does not appear in a stationary engine, so that the compound locomotive cannot be judged by stationary standards, and the only true comparison to be made is between locomotives of similar construction and weight, equipped in one case with compound and in the other with single-expansion cylinders. One of the legitimate advantages of the compound system is, that owing to the better utilization of the steam, less demand is made upon the boiler, which enables sufficient steam pressure to be maintained with the mild exhaust, due to the low tension of the steam when exhausted from the cylinders. This milder exhaust does not tear the fire, nor carry unconsumed fuel through the flues into the smokebox and from there out of the smokestack, but is sufficient to maintain the necessary rate of combustion in the firebox, with a decreased velocity of the products of combustion through the flues. The heating surfaces of a boiler absorb heat units from the fire and deliver them to the water at a certain rate. If the rate at which the products of combustion are carried away exceeds the capacity of the heating surfaces to absorb and deliver the heat to the water in the boiler, there is a continual waste that can be overcome only by reducing the velocity of the products of combustion passing through the tubes. This is effected by the compound principle. It gives, therefore, not only the economy effected by a smaller consumption of water for the same work, but the additional economy due to slower combustion. It is obvious that these two sources of economy are interdependent. The improved action of the boiler can be obtained only by the use of the compound principle, while the use of the compound principle enables the engine to develop its full efficiency under conditions which in a single-expansion engine would require a boiler of such large capacity as to be out of the question under circumstances usually governing locomotive construction.

RESULTS.

On the	Percentage of Economy.
Philadelphia & Reading R. R. (anthracite)	31.43
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Income bonds are now being received for exchange into Second Mortgage Bonds, Class A, under the Plan of Conversion, in effect June 1, 1892, by the following-appointed agencies:

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80 B'way, New York City.

BARING BROTHERS & CO., LIMITED,
8 Bishopsgate-within, London, E. C.

Holders forwarding bonds from distant points in America should ship them, by express, to the Union Trust Company of New York, 80 Broadway, New York City.

Holders in foreign countries should ship their bonds to Baring Brothers and Company, Limited, London.

All expenses of transmission of bonds delivered at either of the above agencies will be paid by the Atchison Company.

Pending preparation of engraved bonds, the work upon which is proceeding with dispatch, Negotiable Certificates of the Company and Depositary will be delivered Income Bondholders, to be exchanged without unnecessary delay for the former in due course. Application to list these Certificates has been made to the Stock Exchanges in Boston and New York.

Income Bond Scrip of any class will be received for exchange, the same as the bonds, in amounts not less than $100, and in even hundreds or thousands.

Holders of any of the bonds called for exchange, under Circular 63 of Oct. 15, 1889, upon presenting their bonds to any of the Agencies mentioned, can effect the original and present exchanges at the same time.

To Enable the Company and Its Agencies to Promptly Carry Out the Exchange Offered Herein, Holders Should Deposit Their Income Bonds Before July 15, 1892.

SUBSCRIPTION TO SECOND MORTGAGE 4 PER CENT. GOLD BONDS CLASS "B."

The management considers at present a fair basis of market value of the new Second Mortgage 4 Per Cent. Gold Bonds Class "B" to be 70.

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Each depositor of $1,000 in Income Bonds will be entitled to subscribe for $100 of the new Second Mortgage Class "B" Four Per Cent. Bonds. In the event of applications exceeding the total amount to be offered for subscription, the excess will be adjusted in proportion to holdings.

Arrangements have been made by which this subscription has been underwritten, a syndicate having been formed to take all the bonds not availed of by Income Bondholders.

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ORAL AND WRITTEN INQUIRIES concerning this Plan and applications for Circulars and blanks for use thereunder can be made of Messrs. BARING, MAGOUN & CO., 15 WALL ST., NEW YORK CITY, Messrs. BARING BROTHERS & CO., LIMITED, LONDON, ENGLAND, and of J. W. REINHART, VICE-PRESIDENT, ATCHISON COMPANY, 95 MILK ST., BOSTON. By order of the Board of Directors.

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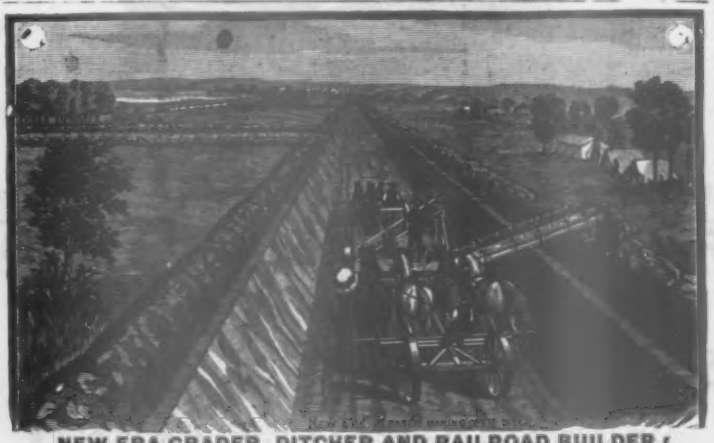

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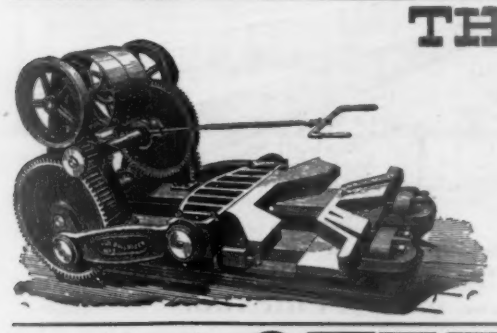

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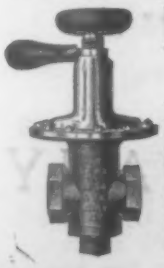

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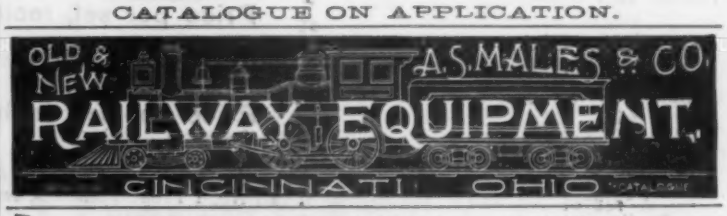

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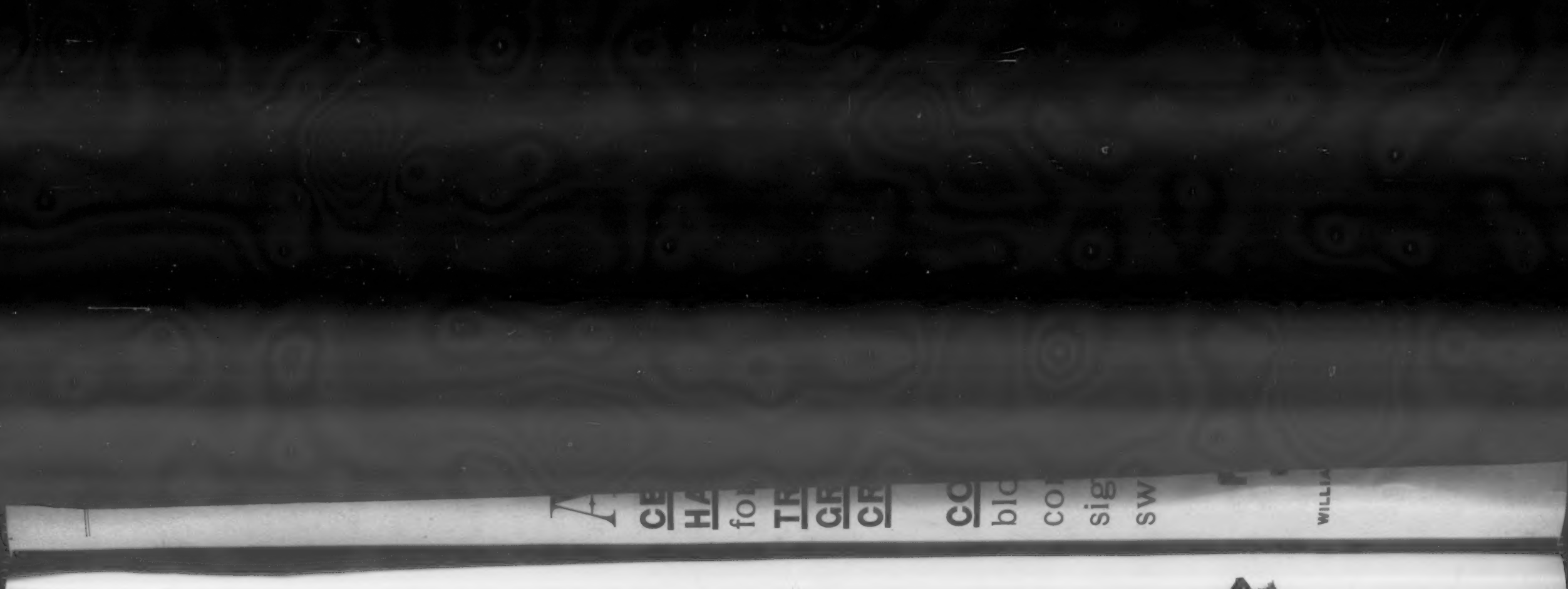
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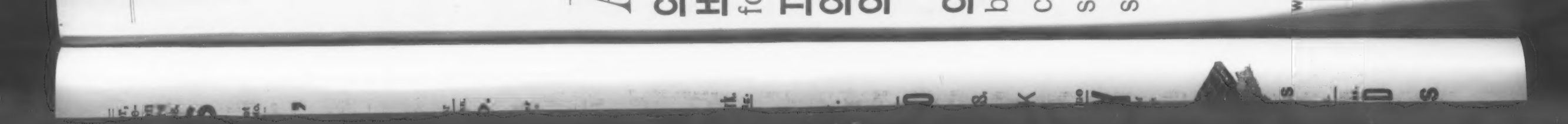

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RAILROAD GAZETTE

FRIDAY, JUNE 10.

CONTENTS.

Contributions.

Average Cost of Freight Car Repairs.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your correspondent writing on the cost of freight car repairs in the *Railroad Gazette* of June 3, under the *nom de plume* of "Syntax" is, according to my way of thinking, "way off." Perhaps I do not understand him. In his tables he says that it costs on an average 12 + cents per freight car per mile, for the average of the roads he quotes. He also says that the cost varies from six cents to 25 cents per mile run. What can he mean? On the large system with which I am connected the cost averages 4½ mills per mile run, with an equipment that is more complicated than the average. It varies only between say four mills and six mills. If "Syntax" is right, it would cost some roads about $50,000,000 a year for car repairs.

Regarding what "Syntax" says about the M. C. B. rules, the question is somewhat involved, and you would not care to give me room for discussion of the matter; but if the rules are uniform and the same for all, are they not as fair to one road as another? The absolute amount of money that even large roads have to pay to each other under the M. C. B. rules is not large, being only a few hundred dollars a month for our road; and the amount we receive from other roads about balances it. So far as private car lines are concerned, that is a different matter, and every effort should be made to reduce the number of private cars in use. If the compensation for mileage could be reduced to half a cent a mile, it would have a wholesome effect on those who build cars for the purpose of renting. The forcing of private cars upon any road with the consequent mileage charges, when the road may have plenty of cars of its own lying idle, is a great evil.

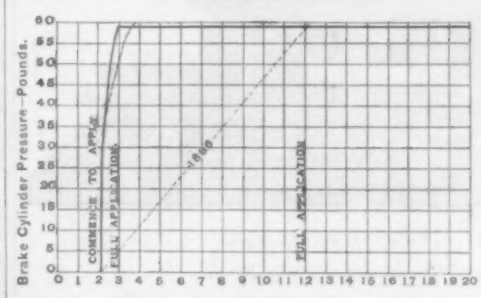
I would like to have "Syntax" give the basis of his estimate.

AN OLD RAILROADER.

Quick Action Brakes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to your article last week on "Quick and Slow Acting Brakes," the diagrams may represent some brakes, but do not represent the action of the brakes on the tests referred to. May I ask you to publish the inclosed illustration, which is a copy of an actual diagram taken with an indicator from the last car of a 50-car train; to which is added the cylinder pressure line of the quickest acting brake in the 1886 trials. The diagrams show that the action in both brakes is substantially the same, except toward the end of the full application. The quick-action device in each case opens the train pipe to the brake cylinder and discharges air from the train pipe to the brake cylinder until the pressures are equalized. This gives about two-thirds the full cylinder pressure in one quarter of a second; then for 1¼ seconds the Westinghouse pressure is greater by an average of 4½ lbs., but the New York pressure then increases to a maximum 2 lbs. higher and maintains that difference. The difference in braking force during the first two seconds is very little in quantity, but it seems to have made a great difference in quality in the recent tests. At the Lehigh Valley tests the Westinghouse train, which reached its maximum pressure the quickest, had dangerous shocks at every stop, while the New York train, although stopped in shorter distances, had only nominal shocks. The difference in quality is this: The Westinghouse brake brings all the brakes into action up to *two-thirds* the braking power as quickly as possible, by air from the train pipe; and follows that up with air from the reservoir that reaches the maximum 10 cars behind the application from the train-pipe. Therefore, the front of the train is braked solid, while the most of the train is running free. The New York brake brings all the brakes into action up to *two-thirds* of the total braking power as quickly as the Westinghouse, and then gradually increases to the maximum, which in two seconds is 2 lbs., higher than the Westinghouse. This advancing wave of maximum pressure is evenly distributed over 25 or 30 cars, and has proved most effective in eliminating serious shocks.



In the 1886 trials the quickest acting brake required ten seconds to reach the maximum pressure. This is not fast enough to compare with the recent tests I cannot agree, therefore, with the closing paragraph of the above article, which says: "All this was conclusively proved by the Burlington brake trials in 1886, and is not a new argument to those who have studied the results obtained." The trains in 1892 were stopped in less time than the full pressure was reached in the middle car in the 1886 trials. Is not the best standard the one which will stop a train in the shortest distance and without shock?

A. P. MASSEY, M. E.,
New York Air Brake Co.

Schenectady Suburban Locomotive for the Chicago & Eastern Illinois.

[WITH AN INSET.]

The Schenectady Locomotive Works has recently delivered to the Chicago & Eastern Illinois two double-end locomotives for heavy suburban traffic. The engraving shown on the inset in this issue gives a general view of one of these engines. It is a six-wheel coupled single expansion engine, with a centre-bearing two-wheel leading truck with a radius bar. The tank has 2,400 gallons capacity and is carried upon an extension of the main engine frame, beneath which is a six-wheel swing bolster centre-bearing truck. The weight upon the wheels of this truck is distributed by means of equalizing "porpoise" springs. The tank extension frame is composed of two heavy channels bolted to the engine frame extension. The rear drawbar, attached to the transom just back of the centre pin, is a heavy wrought iron forging about 5 ft. long ending in a yoke large enough for a link and pin connection. The forward drawbar, similar to the rear one, is attached to the frame supporting the centre pin of the leading truck. The strap supporting the outer ends of the drawbars permits a vertical play of several inches and a lateral motion of about 10 in. either side of the centre. There is a heavy flat steel spring under the ends of these drawbars which reduces the disagreeable motion imparted to the car next to the engine by the vibration of the engine when running at high speed.

The steam used for the lubricators, air pump, etc., is taken directly from the dome through the usual steam box on the boiler head. The steam for injectors is taken through independent valves in the dome. The cab rests on an extension of the tank. There are two ventilators in the roof. The coal space in the tank holds 4½ tons of soft coal, and is so constructed that the coal falls down into the fireman's pit without any raking or unnecessary shoveling. These engines have two smoke preventing devices, the "Wabash" and the "Hutchinson." They are intended to be used together. A diaphragm regulator for adjusting the height of the diaphragm in the smokebox is operated by a lever placed in the cab. The lever is attached to the hand rail which extends into the cab, the forward end of the hand rail being attached to the regulating device by suitable crank and rod connections. This device is used to regulate the draft upon the fire by raising or lowering the diaphragm. The engine is equipped with a Cooke bell ringer operated by compressed air, Westinghouse air brakes and signals and steam and lubricator connections for electric headlights, of which quite a number are in regular use on this road. The firebox has a brick arch with water tube supports.

The following dimensions are taken from the specifications:

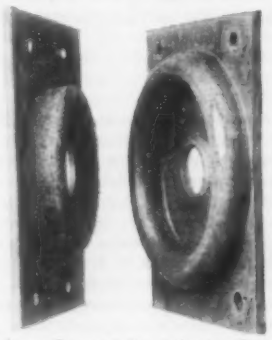
Cylinders	18 × 24 in.
Steam ports	16 × 1¼ in.
Exhaust ports	16 × 2⅝ in.
Richardson balanced slide valve, travel	5½ in.
outside lap	¾ in.
inside lap	0 in.
Drivers, diameter	63 in.
Front and back truck wheels, diameter	30 in.
Front truck journals	5½ in. × 9 in.
Back truck journals	4½ in. × 8 in.
Weight on drivers in working order	95,000 lbs.
on front truck	14,000 lbs.
on rear truck	62,000 lbs.
Total weight in working order	171,000 lbs.
Total wheel base	35 ft. 7 in.
Rigid wheel base (drivers)	12 ft. 9 in.
Boiler, wagon top, diameter, first ring	56 in.
Working pressure	180 lbs.
Fire-box, length	90 ⅞ in.
width	41⅝ in.
depth, forward end	61¾ in.
depth, back end	54¾ in.
water space, front	4 in.
water space, back	3½ in.
Tubes, of charcoal iron, number	247
diameter	2 in.
length	11 ft.
Heating surface, in tubes	1411.8 sq. ft.
in firebox	137.0 sq. ft.
total	1,548 sq. ft.
Grate surface	25.7 sq. ft.

These engines are now in regular service and are reported as riding easy and steaming well. A good feature not usually seen on locomotives of this type is the arrangement for distributing the sand. A single lever in the cab operates four valves leading to the two front and two rear sand pipes. When the lever is in a central position both valves are closed. By pushing the lever in the direction in which the engine is moving the sand is allowed to fall beneath the leading drivers.

These are handsome and powerful locomotives, but none too powerful for the suburban service on the Chicago roads, where the trains frequently consist of ten to fourteen fully loaded passenger cars.

Test of a Pressed Steel Centre Plate.

We give below the results of a test of a pressed steel centre plate made by Messrs. Hunt & Clapp, Pittsburgh, Pa. The test was made for the Schoen Manufacturing Co., the centre plates having been made by them. The design is that decided upon by the M. C. B. committee as the most desirable in form and dimensions.



Schoen Pressed Steel Centre Plate.

The report of Messrs. Hunt & Clapp is as follows:

Load in pounds.	Height of plates.
100,000	3⅝ in.
110,000	3⅝
120,000	3⅝
130,000	3⅝
140,000	3½
150,000	3½
160,000	3½
170,000	3½
180,000	3½
190,000	3½
200,000	3½
210,000	3½
220,000	3½
230,000	3½
240,000	3½
250,000	3½
260,000	3½
270,000	3½

"At a pressure of 270,000 lbs. the top of ring of truck plate was bearing against the flange of body plate; otherwise the plates were in as good condition as when the pressure was first applied."

Abolition of the Broad Gauge on the Great Western of England.

[FROM A SPECIAL CORRESPONDENT.]

LONDON, May 26, 1892.

A week ago to-day there was a length of nearly 200 miles on the Great Western Railway built exclusively for broad gauge traffic, according to the plan devised and introduced by the famous railroad engineer, Brunel, some fifty years since. To-day there is not a yard of it left; and the task of converting a gauge of 7 ft. into the standard width of 4 ft. 8½ in. along the length of line above mentioned, has been completely accomplished, without serious accident or delay, within the short space of 31 working hours.

In 1845 the Great Western deserved some such title as the "Broad" Western Railway. Its mileage then open amounted to 274, the whole of which was built on the 7 ft. gauge. Nine years later the inconvenience felt at several points of connection with other lines built on the usual 4 ft. 8½ in. gauge, made it essential that the rolling stock of the latter should at least be able to run over some of the broad gauge lines, in order to save transhipment both of passengers and freight. This was accomplished by putting down a third rail inside the two broad gauge rails, so that the "narrow" gauge traffic might run upon this third rail and one of the broad gauge rails.

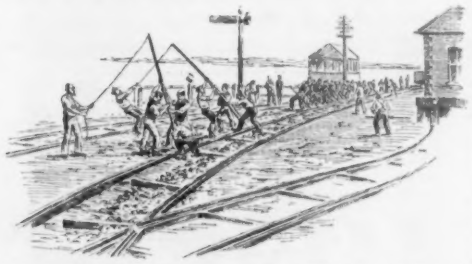
For this purpose the ordinary traffic would be temporarily confined to one track—say the up line—while the down line could be altered as desired, and conversely. No complete interruption would therefore take place, and the work of "mixing" the gauges in this way has gone steadily on ever since upon the main lines of the Great Western system. Even so late as 1867, however, there was still a far greater proportion of broad gauge than of narrow, the total mileage of the former being no less than 1,450; so potent was still the influence of Brunel, though he himself was no longer living.

PASSENGER LOCOMOTIVE FOR THE PENNSYLVANIA RAILROAD.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

At the commencement of the present year, out of a total mileage of some 2,500 the Great Western Railway possessed about 420 miles laid with the mixed gauges; from 170 to 200 built solely on the 7-ft. gauge, and the balance wholly of narrow gauge.

Brunel's methods with regard to permanent way structure were based on the theory of a rigid non-elastic road, upon which he ran the heaviest vehicles that had been so far designed for railroad work. He was undoubtedly right in this, when one considers the general design of rolling stock then used; but the modern bogie truck vehicles of great length and considerable weight, probably travel better on a transverse sleeper road with rail joints as flexible as fish plates will allow them to be, than they ever would on the continuous longitudinal sleepers with solid rail joint, employed by Brunel on his broad gauge lines. The latter, therefore, have lost in this respect a great part of such comparative advantages as might be claimed for the system; while the inconvenience of keeping up two separate kinds of rolling stock, and the trouble and expense of transhipment from one to the other, forced the railroad company many years ago to recognize the unfailing doom of their broad gauge line, whatever its intrinsic merit.



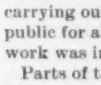
Changing the Gauge of the Great Western Railway of England. Sketch Made at Starcross.

The men seen in the foreground are bringing the rail up to its proper level after its position has been changed. The large gang in the background are slewing the rail and sleeper from the old to the new position. Several transoms already cut off are seen in the foreground.

The operations, just concluded, of converting the gauge have possessed a great deal of interest. This was the last broad gauge in England. It was necessary in carrying out the work to close the line completely to the public for all traffic during the two days in which the work was in progress.

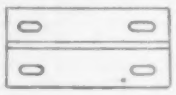
Parts of the line are single track, making additional difficulties. On the portions heretofore converted the principal lengths have been from the outset double track, as, for instance, throughout this company's South Wales district. Here the gauge was altered without completely interrupting the traffic, but it was naturally a work of weeks instead of hours to accomplish this with safety.

On the majority of the mixed gauge lines the usual plan adopted has been to replace the longitudinal sleepers with the ordinary type, transverse to the rails, a third rail being then laid inside, as already stated. It would, of course, have been extremely difficult and expensive to lay down a third longitudinal sleeper, hence the necessity for employing the transverse type, so that bull-head rails might be used with cast iron chairs. The rail adopted by Brunel was a hollow or bridge rail—as will doubtless be remembered—which, of course, is better suited to a continuous sleeper. In view of the details which I propose to give, let me briefly describe the leading characteristics of Brunel's permanent way, so that the labor necessary to alter it can be duly appreciated. As will be seen from the sketches, wood sleepers (measuring 11 in. wide by 6 in. deep) are laid continuously end to end beneath each line of rail; the rails themselves—of bridge type, as stated—have wide flanges, and are somewhat of the section shown in the sketch. They are secured to the sleepers by square-headed bolts—¾ in. diameter—passing through the rail flanges, and screwing into fanged washers on the underside of the sleepers. The fangs of these washers penetrate into the wood, and serve to lock the bolt. Thin pieces of wood are first, however, inserted continuously between the rails and sleepers, so that the former do not bed themselves direct upon the sleepers. The proper cant of the rails is thereby preserved more easily.



The longitudinal sleepers of each line of rails are cross connected by means of stout wood transoms at a distance of every 10 or 12 ft.; these transoms are dovetailed into the sleepers and held tightly in place by wrought iron rods, about 3 ft. long, screwed at one end and flattened out at the other. The rods are spiked or bolted to the sides of the transoms through the flattened ends, the screwed ends passing through the sleeper and being held by means of nuts. At intervals of say every sixth transom a long iron screwed tie rod passes right across from one sleeper to the other, being secured to them by means of nuts also. These rods serve to give the requisite tension or drawing of the rails together, while the transoms act as distance pieces.

The rails at each joint are bedded upon an oblong iron plate (see sketch), measuring about 12 in. long by 7 in. wide, with a rib an inch thick running down the centre lengthways. This rib fits into the hollow ends of the bridge rails and so prevents side play.



The plates are slotted out for ¾-in. bolts, somewhat as shown, and they certainly give a remarkably stiff joint.

As has been said, the cost of putting down a third longitudinal sleeper to "mix" the gauges would have been excessive, and the wisdom of such a step more than doubtful. The simplest thing to do was to cut the transoms to suit a 4-ft. 8½ in. track, take out the tie rods on the one side—with all the long ones also—and slew or push the continuous sleeper and rail inward as far as necessary. The obstacle to this method was the fact that a great part of the line along the shore and among the hills (where the gradients and viaduct works are both heavy) consisted only of one pair of rails, so that the whole traffic would be stopped during the alterations.

Although the company is busily engaged in double tracking the line as fast as possible, it was at length decided that the continued inconvenience and expense of breaking gauge at numerous points made it necessary to alter the gauge at once even at the cost of stopping traffic for awhile.

Saturday and Sunday last were therefore chosen for the work, and on Friday evening at 5 p. m. I left London in the last broad gauge train to pay a visit to the scene of operations.

Great regret appeared to be shown by all the railroad people at the final abolition of the system, as though they were witnessing the death of an old and well tried servant. However, it is probably a case of "Le Roi est Mort; Vive le Roi," for the standard gauge trains certainly seem to run no whit less easily than the old broad gauge, in fact personal experience would lead me to prefer the former.

Throughout Friday evening a number of special trains were made up of all the broad gauge rolling stock in the district west of Exeter (the part where the gauge was to be altered) and great care was exercised that no vehicles should be left behind to be literally stranded. The passage of the last broad gauge empty eastwards to Exeter and Swindon about 4 a. m. Saturday was a signal for the navvies to turn out and begin the work. A small army of 5,000 men had been drafted into the district from various parts of the company's system and separated out into gangs of 50 or 60 each under the care of an inspector.

About 2 to 2½ miles of line was allotted to one gang, the distance varying, of course, with the work involved there being but few men required for the long stretches of straightforward work, while large numbers had to be grouped at the stations. The men were housed in or or about the various station premises or else in special tents erected alongside the line.

The operations to be gone through consisted of perhaps four processes—there was first the ballast to be removed from inside the sleepers; next the transons required cutting and the tie rods taking out; thirdly, there was the rail and sleeper to be slewed inwards; and, last, the tie rods to be replaced and bolted up, followed by the rough ballasting. The ballast had been removed some time beforehand, thus not interfering at all with the traffic, and perhaps two-thirds of the transoms cut through in readiness for taking out the pieces. The first duty of the men therefore on starting work—with the traffic stopped and the lines all clear—was to shorten all the transoms and remove the tie rods. Then followed the "muscle" work, slewing the rail inwards. This looked less laborious than it was, and the gangs of fifteen or twenty men who did the work fully appreciated the buckets of oatmeal and boiling water supplied them to drink.

By noon on Sunday all the main lines were altered, ready for traffic; and the pilot engine and van on which I accompanied the division engineer over one of the worst parts of the line to deal with, ran as steadily and as smoothly as could be wished.

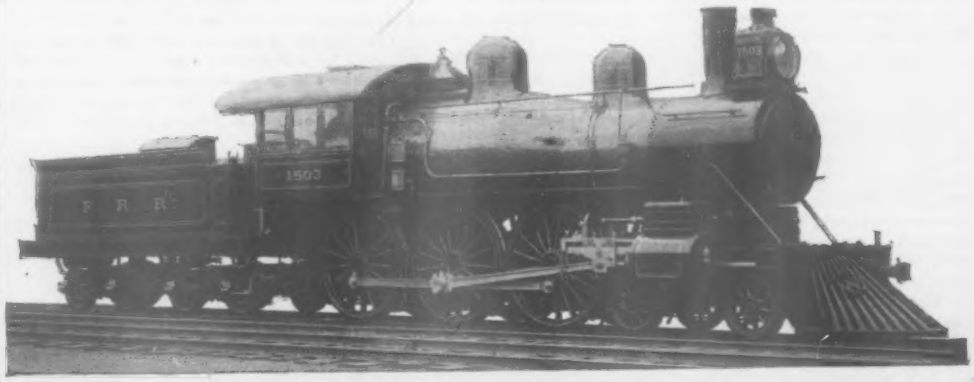
By Sunday evening, after 31 working hours, the lines were everywhere ready for trains, and traffic was resumed on Monday morning as usual, a standard gauge train being then able for the first time to run right through the line from Penzance in Cornwall, to Paddington—the London terminus of the company. The enormous bulk of early vegetables, fish and similar freight sent from the southwest of England will now have a free vent throughout the North and East, without requiring transhipment. The importance of this traffic has been a potent factor in deciding the company to alter the gauge.

Changing the Gauge of the Great Western Railway. Sketch Made Between Starcross and Exminster.

The left hand track is broad gauge and the other has been narrowed. The workmen are rough-ballasting the track.

Passenger traffic in the opposite direction—southward to the Devonshire and Cornish watering places—will also be fostered by better through time.

Several other points possess interest; for instance, advantage was taken of the fact that the line would be narrowed to ease the curves here and there, where it was possible to do it by shifting the rails first on one side then on the other. The island platforms at the chief stations had also to be widened by the amount of



TWO-CYLINDER COMPOUND PASSENGER LOCOMOTIVE FOR THE PENNSYLVANIA RAILROAD.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

difference between the 7 ft. and the 4 ft. 8½ in. gauges; but this of course presented no very great difficulty, temporary additions of stout planks being erected on cross bearers and uprights.

At some of the small bridges, where the rails were run on separate girders, it was necessary to push one of these bodily towards the other along the masonry coping, but by erecting timbers underneath, the weight in each case was eased off whilst the girder was shifted with sleeper and rail in position. The gauge on Brunel's famous suspension bridge at Saltash—which forms part of the main line—was narrowed by laying down, just inside the old broad gauge rails, two longitudinal continuous sleepers, 17 in. wide, and connected by means of crosstransoms. Upon these sleepers are bolted iron chairs of the ordinary type, with bull head rails keyed in them at the standard gauge. The new rails stand higher than the old ones, but the bridge will be safer than it was before, the broad gauge rails and sleepers serving somewhat as guards to prevent spreading.

The intention is eventually to relay the whole of the line just changed with transverse sleepers to take the place of the longitudinals still in use. The weather during the whole of the time of the change was simply perfect. There were no accidents worthy of the name.

Considered as a whole, the work was extremely well and rapidly done; the men buckled to with vim, were hard at it on Saturday from 5 a. m. to 9 p. m., and again on Sunday from 5 a. m. to 8 p. m. The men from a distance were ordered to be ready to leave home on Thursday, the 19th, with sufficient food to last them until the 24th, though the company furnished oat meal and hot water for them on the ground, and "through the kindness of Mr. W. H. Wills, one of the directors," each man received two ounces of tobacco. Some of the men slept in freight houses, and the company furnished each with two rugs and a bag filled with straw. The men were paid the regular ordinary and overtime rates for the hours they worked, and for the time they were away from home received 25 per cent. additional, besides one shilling per man for each night he was away from home.

On Friday the men worked their regular hours, making preparations, changing side tracks, etc. Monday was occupied in ballasting and clearing up the tools. On Tuesday the men were drafted back to their respective districts, and as might be expected from the tension of work during the previous two or three days, were somewhat jovial at quite an early hour. Their conduct, however, taken altogether, deserved every possible praise, and the engineers in charge may be congratulated on the way in which they got the work done.

F. B. L.

Schenectady Locomotives for the Pennsylvania.

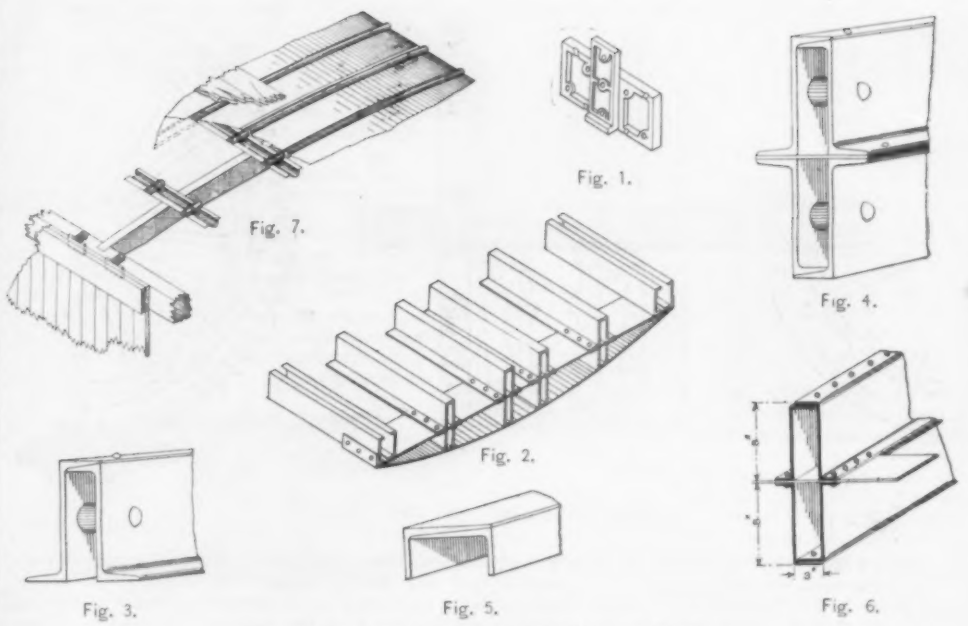
The two locomotives shown on the opposite page were designed and built by the Schenectady Locomotive Works for the Pennsylvania Railroad. They are intended for service on the divisions between Philadelphia and Pittsburgh, and to haul the New York & Chicago limited trains. We have mentioned the fact before that the Pennsylvania has, within a few months, ordered several new locomotives of various types and different makers for trial in its fast and hard service. The two which are shown to-day belong to this lot of engines.

As will be seen by the engravings and description, the boilers are of the extension wagon top style, the crown sheet being supported by radial stays. The boiler plate is 7/16 in. and 5/8 in. thick, the horizontal seams being butt welted. The boilers are designed for carrying 180 lbs. working pressure.

The driving springs on both engines are hung underneath the driving boxes. All the driving wheels and engine and tender truck wheels have Krupp tires held by retaining rings. The driving boxes are of solid Ajax metal.

GENERAL DIMENSIONS.

	Eight-wheel simple passenger.	Ten-wheel compound passenger.
Fuel	Bituminous coal.	Bituminous coal.
Gauge	4 ft. 9 in.; ¾ in. play.	4 ft. 9 in.; ¾ in. play.
Weight on drivers	81,000 lbs.	102,000 lbs.
" trucks	42,000 "	36,000 "
" total	123,000 "	138,000 "
Wheel base, driving.	8 ft.	13 ft. 2 in.
" " rigid	8 ft.	6 ft. 9 in.
" " total	23 ft. 5 in.	23 ft. 11 in.
Diam. of cylinder	19 ins.	R. H. 30 in. L. P. L. H. 20 in. H. P.
Stroke of piston	24 in.	24 in.
Size of steam ports	18 in. × 1⅝ in.	L. P. 21 in. × 2½ in H. P. 19 " × 2¾ "
" exhaust "	18 " × 3 "	L. P. 21 " × 3 " H. P. 19 " × 3 "
Travel of slide valve	5½ in.	6½ in.
Lap "	outside ⅞ " inside.	1⅛ in.
Clearance "	inside.	L. P. 1/16 in. H. P. ⅛ "
Kind "	Allen Richardson, balanced.	Allen Richardson, balanced.
Diam. of driving wheels outside of tire	78 in.	74 in.
Diam. and length of driv. axle journals	8½ in. × 11 in.	8 in. × 10 in.
Diam. Eng. truck wheels	36 in.	33 in.
Diam. and length of Eng. truck axle journals	6 in. × 10 in.	5½ in. × 9 in.
Working pressure of boiler	180 lbs.	180 lbs.
Style of boiler	Extended wagon top	Extended wagon top.
Diam. of first ring outside	58 in.	58 in.
Size of firebox length	96⅞ in.	96⅞ in.
" " width	39¼ "	39¼ "
" " depth	F. 70¾ " B. 61¾ "	F. 69¾ " B. 60¾ "
Water space all around	4 in.	4 in.
Crown supported by	1 in. radial stays.	1 in. radial stays.
Tubes, material	Charcoal iron No. 11.	Charcoal iron, No. 11
" No. of	268	208
" dia. and length	2 in. × 12 ft.	2 in. × 13 ft.
Heating surface, tubes	1,672.2 sq. ft.	1,811.5 sq. ft.
" " firebox	144.3 "	141.7 "
" " total	1,816.5 "	1,953.2 "
Grate surface	26.2 "	26.2 "
Throttle	Balanced valves, Double poppet.	Balanced valves, Double poppet.
Tender.		
Wt. of tender, empty	42,000 lbs.	42,000 lbs.
Number of wheels	8	8
Diameter of wheels	36 in.	36 in.
Diameter and length of journals	4½ in. × 8 in.	4½ in. × 8 in.
Total wheel base of tender	16 ft. 2 in.	16 ft. 2 in.
Style of tender frame	Channel iron.	Channel iron.
Style of tender truck	S. L. W. standard four-wheel channel iron bolster, centre bearing front and back, with additional side bearings on back truck.	S. L. W. standard four-wheel channel iron bolster, centre bearing front and back, with additional side bearings on back truck.
Water capacity	3,500 galls.	3,500 galls.
Coal capacity	8 tons.	8 tons.



The Hodges Steel Construction Applied to Car Details.

The Hodges Plan of Steel Construction.

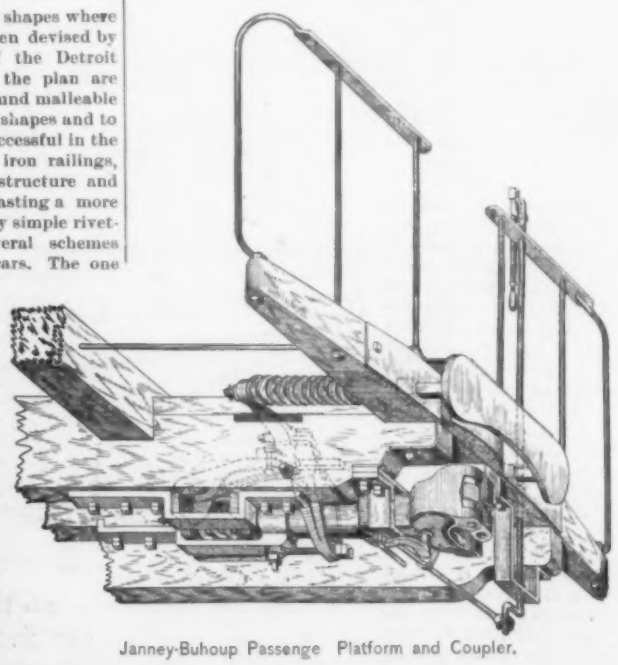
An ingenious method of joining rolled shapes where they cross each other at any angle has been devised by Mr. H. C. Hodges, of Detroit, President of the Detroit Lubricator Company. The elements of the plan are shown in fig. 1. They consist of a compound malleable iron casting adapted to fit the two rolled shapes and to be bolted to them. The plan has proved successful in the joints of pipe roof trusses and for angle iron railings, and has now been adapted for the superstructure and sills of freight cars. By the compound casting a more secure joint is obtained than can be had by simple riveting. Mr. Hodges has designed several schemes for adapting the construction to freight cars. The one here shown is the latest and the best he has devised. There are several types of sills; some made of Z bars, others of channels and angles. These are shown in figs. 2, 3, 4 and 5. Fig. 6 shows how the transverse plates are riveted to the sills. The construction of rolled shapes having a "U" section, for roof, is shown in fig. 7. In connection with this method of joining rolled shapes Mr. Hodges has devised a car of unusual length having a central truck. The truck is of special design made from rolled shapes, and while it is heavy and somewhat expensive, it has a high carrying capacity. The roof is covered with corrugated iron with the corrugations spaced so as to correspond with the sections of "U" shaped iron shown in fig. 7.

Janney-Buhoup Passenger Coupler and Buffer.

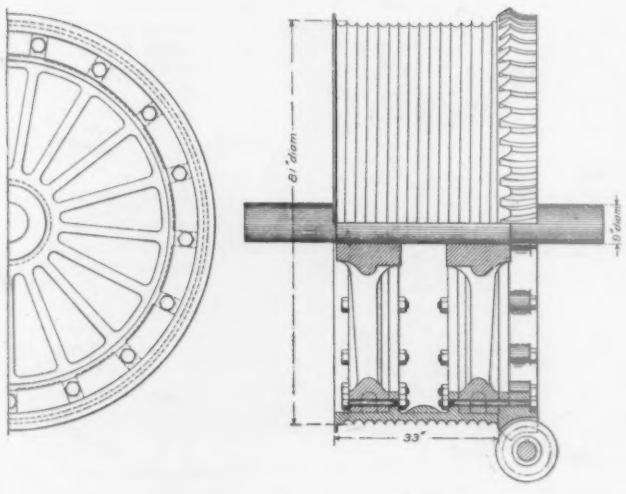
In the *Railroad Gazette*, Jan. 22, 1892, Buhoup's vestibule equalizer device was described as being one which caused an increase of pressure to be brought upon the face plates of the vestibules whenever the cars were pressed together or pulled apart. The mechanism which brought about this action is adapted as well for use on cars that have not the vestibule, and the arrangement of the parts for such use is shown by the illustration with this. It will be noticed that the arrangement of parts is identical with that for vestibules with the exception that in the one here shown the bell cranks and connections for the top of the vestibule are removed. Perhaps a better understanding of the mechanism will be had if the reader will refer to the illustrations of the vestibule mechanism as above as well as to the illustration now given.

Attached to the regular Janney platform there is what is called a "kicker." It is an arm extending ahead from the rear follower plate to a vertical lever, with a yoke at the bottom end surrounding the drawbar. The lever is pivoted above the drawbar. At the bottom end of the lever there is a connecting rod extending to the drawbar strap, as shown. Whenever the drawbar is pulled out the "kicker" presses on the vertical lever above its fulcrum, and forces out the chafing plate, as is evident from the construction shown. Also, the chafing plate is forced out whenever the drawbar is pushed in, as then the connecting rod pulls on the lower end of the vertical lever, and forces the upper end of that lever forward, carrying with it the chafing plate. In this way it matters not whether the drawbar is pushed in or pulled out, the chafing plates are pressed together in either case. This is an obvious advantage, as it prevents the chafing plates from separating, and keeps them always bearing together, thus holding the cars steady when the engine is pulling out hard.

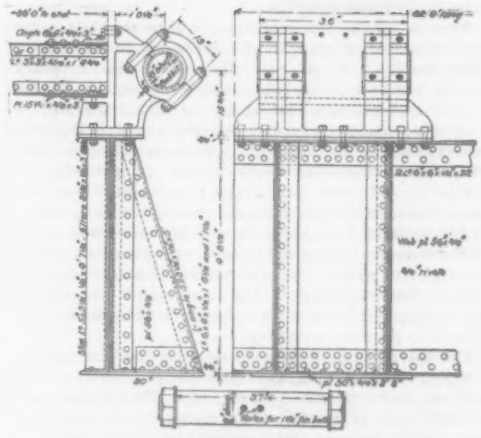
Some of the advantages claimed for this buffer are



Janney-Buhoup Passenge Platform and Coupler.



WINDING DRUM—HARLEM LIFT BRIDGE.



Hinge and Pin.

that it gives a positive spring pressure on the buffers at all times; it is strong and easily repaired; it can be converted for the Janney-Miller combination buffer without changing the timbers; it can be uncoupled from the ground or from the platform, as may be most convenient.

This buffer and coupler is made by the McConway & Torley Co., Pittsburgh, Pa.

Lift Bridge Over the Harlem River.

The illustrations show an ingenious lift bridge put in by the New York Central & Hudson River Railroad over the Harlem River at 135th street and Fourth avenue, New York City. The bridge at this point is used by about 500 passenger trains daily, and any interruption is therefore of very serious consequence. Some months ago a steamboat ran against the pivot draw and damaged it considerably. Neither railroad nor river traffic was interrupted, but the incident showed the importance of maintaining the integrity of this crossing, and the officers of the road at once decided to have an auxiliary or emergency draw, and the structure here shown was decided upon. It takes the place of the former fixed span south of the pivot draw, and in the ordinary course of traffic will not have to be lifted.

The bridge in question consists of a double-track plate girder span, 92 ft. 6 in. long, and 28 ft. in width, pivoted at its southerly end. This span was constructed in place, on piles driven in the channel, closing it temporarily. The bridge is hinged on two pins, 8 in. in diameter and 37 in. long, fixed in the two outer girders and journaling in two double hinges attached to the abutments, as shown in the engraving. The tower from which the bridge is operated is 127 ft. 9 in. in height, and is constructed of latticed posts thoroughly braced.

The lifting is done by two double 2-in. steel cables. These cables pass around a sheave at the outer end of the bridge, thence up and over a sheave on the tower, 77 ft. 6 in. above the ground, thence down to the lifting drums on the 28-ft. level, thence upward over a sheave at the extreme top of the tower and down inside the posts, where the counterbalance weights are attached. The sheave on the outer end of the bridge is 2 ft. in diameter and is intended merely to equalize the strain on the cables. The other sheaves are 6 ft. 10 in. in diameter, and are made of old locomotive driving wheels, the rims being grooved to take the cables, as shown. The centres of the winding drums are also made of old driving wheel centres.

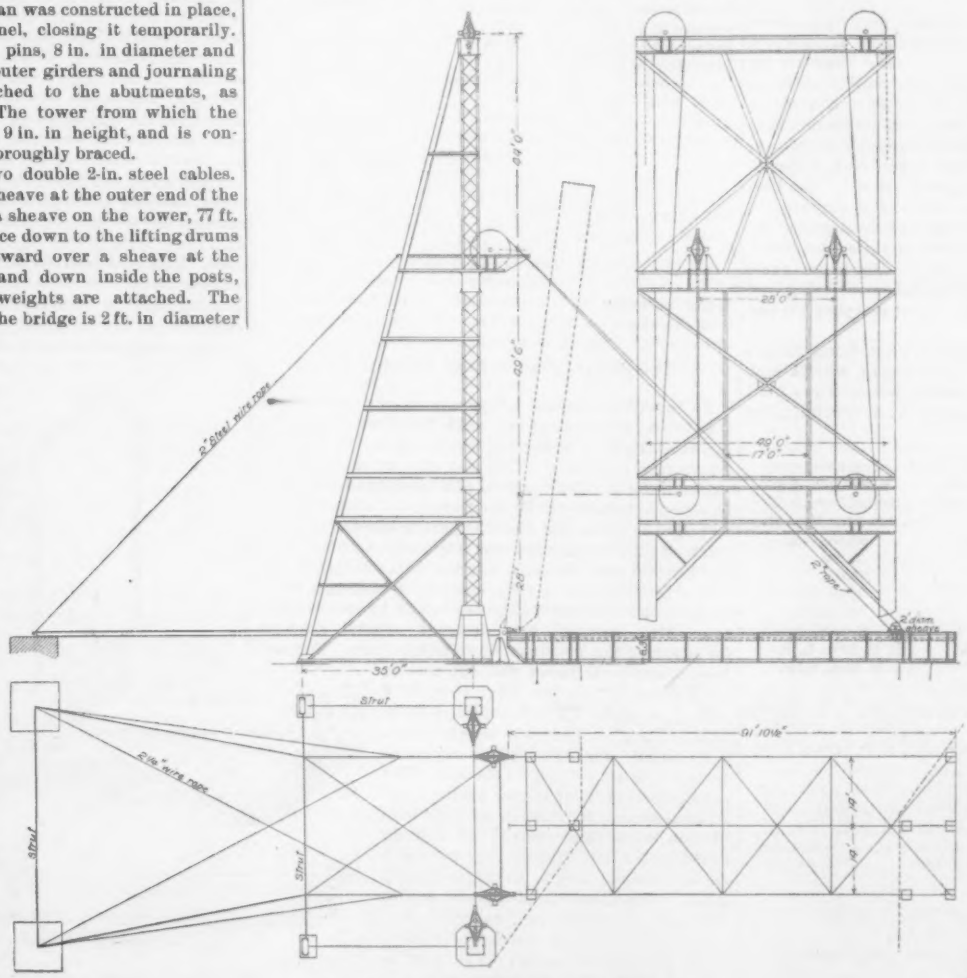
The lifting engine is of the horizontal pattern, with two cylinders, 10 × 14½ in., taking steam at 80 lbs. initial pressure. The main shaft extends across the tower and operates the winding drums, which are 6 ft. 9 in. in diameter, by two worms, right and left hand, of 4-in. pitch. The cables make 1½ turns around the drums, and five revolutions of the drums are required to lift the bridge.

The arrangement of the counterweights is rather ingenious. Each set of these weights is divided into 23 stages, the lowest of which is attached to the cables, the other 22 being free, the cables passing through a slot in their centres. When the bridge is raised to a vertical position only the last weight is in action, all the others being suspended in the towers on catches of varying widths, bolted to the sides of the weights. These catches engage on brackets of angle iron, projecting from the interior of the towers, spaced to match the catches on the weights. Each weight has four rubber buffers to lessen the shock when picked up. As the bridge is lowered the weights are picked up in succession until when it is in its horizontal position all are in action and raised to the top of the tower. As the bridge is raised the process is reversed. The total weight of the counterweights is 90 tons. The arrangement of the angles in the interior of the tower for the support of the weights is shown in the engraving.

Mr. G. H. Thomson, Engineer of Bridges of the New York Central & Hudson River, designed the structure, and Mr. John D. Wilkins, Assistant Engineer, is responsible for the details of the machinery. The cost of the bridge was about $40,000. Messrs. Cofrode & Saylor were contractors for the bridge and structure, and the Union Wire Rope and Tramway Co. for the cables and machinery, which were put in place by that company's superintendent, Mr. S. A. Cooney.

Among the advantages of an end lift draw that of time required for a vessel to pass the opening is worthy of consideration. For instance, the time of passage of a vessel through an end lift draw will be the time required to cover a distance equal to the width of the bridge plus the length of the boat, whereas to pass a pivot draw the distance to be covered is the length of the draw plus the length of the boat. When only one opening is to be provided for, an end lift draw is certainly cheaper than a pivot draw. The motion of the end lift draw is under perfect control. This bridge has been lowered at various speeds, producing no perceptible shock at low speed and not much at high speed.

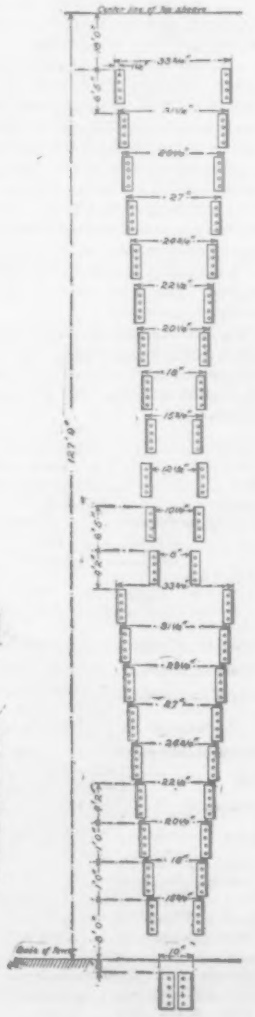
This bridge has been described as a temporary draw, but it is hardly accurate to speak of it in that way. It has been decided to remove the present double track bridge at this crossing, and to construct in place of it a four-track bridge with a clear height of 24 ft. above the water, some 18 ft. higher than the present level, and the new bridge is to be located on the same site as the old. To do this, a temporary bridge will have to be built west of the present line, to carry the trains during the construction of the high level bridge, and the days of the present bridge, with its two draws, are therefore numbered; but the lift draw is permanent in the same sense that the pivot draw adjoining it is permanent. In the high level bridge an emergency draw will be of far less importance, if not almost useless, as nothing but the spars and upper works of vessels can damage the trusses.



Side Elevation, Front Elevation and Plan.

LIFT BRIDGE OVER THE HARLEM RIVER.

New York Central & Hudson River Railroad.



Stops for Counterweights.

A Chinese Freight Car Truck.

The accompanying cuts illustrate a new form of truck designed by Mr. C. W. Kinder for use on railroads in China, which is now adopted there as standard. The description and comments are essentially in Mr. Kinder's language. It can be made by native workmen almost as cheaply as the ordinary diamond trucks, "Thielsen" type, which are imported from America, besides having many advantages. It does not compare with the "Fox" stamped frames for lightness, although it is not very far behind, while it possesses the great advantage of being easily and truly made by natives, has the best running qualities, and is easily repaired.

The characteristics of the truck are big wheels, laminated springs, over journal boxes, with every reasonable effort made to insure the frame being kept "square" in order that the high class wheels may get a fair chance to do high duty. The mileage obtained under these conditions from 42½-in. steel-tired wheels in many cases reaches 200,000 without turning the wheels, although, no doubt, the absence of heavy grades and sharp curves has much to do with this long life. The average wheel is probably more often ruined by neglect to keep it properly centred than by anything else.

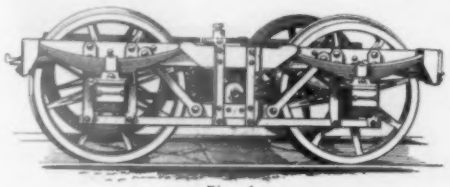


Fig. 1.

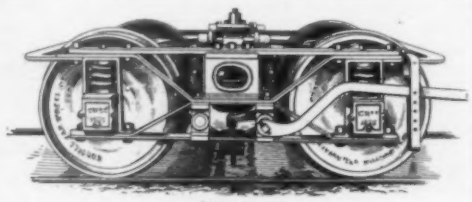


Fig. 2.

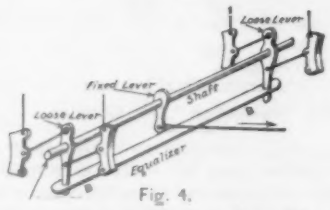


Fig. 4.

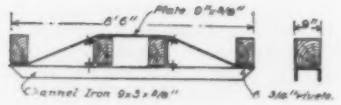


Fig. 5.

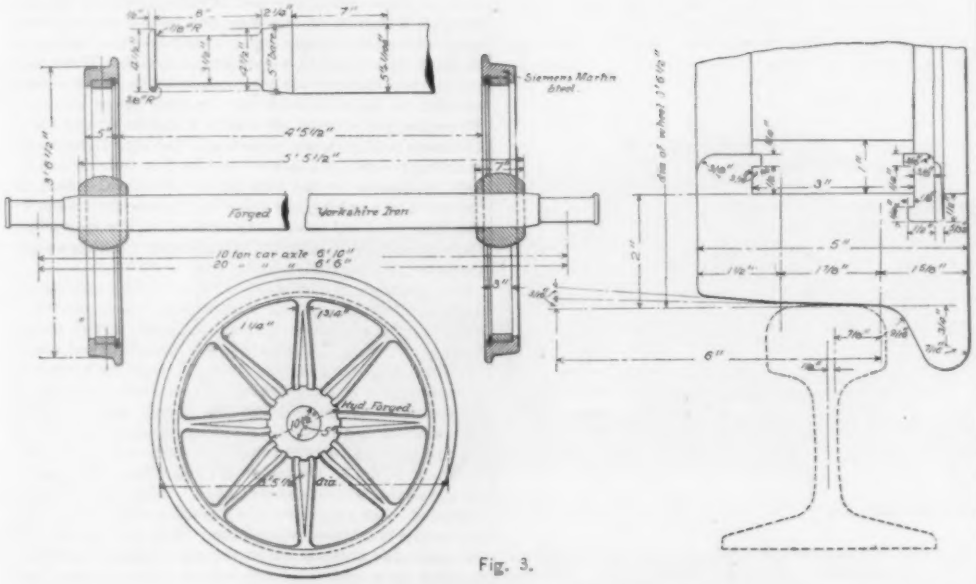


Fig. 3.

A CHINESE FREIGHT CAR TRUCK.

The frame of this truck consists of two 6 in. × 1 in. steel slabs braced at both ends by angle irons, and attached to the truck bolster by four angle irons, which are firmly riveted to the channel irons which compose it. A channel swing bolster is employed on all trucks, as the cars are liable at any time to be used for transport of troops and calvary horses.

The weight of the truck complete is 3⅕ tons, each wheel weighing 769 lbs.; each axle 441 lbs.; each spring 134 lbs., and each journal box (with Macnee's patent oiler) 113⅕ lbs. The journal boxes have cast iron packing rings—which are "sprung up" against the wheel boss to exclude dust. These have superseded the Beuther, which had a paper dust shield which gave out rapidly in the climate of China.

Both 33-in. and 36-in. wheels of the same type are in use, but do not give such good results as regards wear and smooth running, to say nothing of "tractive" qualities, and saving of track joints.

The laminated springs are cheaper in first cost and in maintenance, as they last for an indefinite period if soaked in oil about once in every three years. They also ride much smoother than coil springs.

The parts are assembled on a cast iron erecting block, with horns to grip the axle guards and bolster channels. The riveting is thus done under circumstances which render it impossible to get the frame out of true, and no setting out is required.

The adoption of 42½-in. steel-tired wheels for all rolling stock will no doubt appear an extravagant notion, but in point of fact, when freight and local circumstances are considered, they are the cheapest, beside being the best, for use in China. The cost of four wheels and two axles, f. o. b., averages £23. The accompanying cut, fig. 3, shows the dimensions and mode of attachment of the tire, which is now adopted for locomotives as well as cars.

A number of 33-in. and 36 in. cast iron wheels are in use, and also some of Krupp steel; but there is no doubt that until such can be made and "remade" in China there is no economy in their use. Where labor is cheap there may be serious doubts about their employment, for in America it is only the high price of steel-tired wheels which gives the chilled variety a victory. A longer wheel base (5 ft. 6 in.) is used on the Chinese roads, as much of the flange wear is no doubt due to excessive shortness of trucks. In recent coaches in America 8 ft. and 9 ft. wheel bases are now adopted, which a few years ago would have caused expressions of horror. In fact, most of the best modern 10 and 12-ton four-wheel stock does very well on an 8-ft. base.

The cost of the trucks in use on the Chinese roads, complete with brake rigging, is about the same as the imported Thielsen diamond truck, with 36-in. chilled wheels and timber swing bolster; but a great saving is consequently made in freight.

The cars are intended for 20 long tons, but they often carry as much as 24 tons without any difficulty. They are unusually strong, as indeed all things must be which are worked by natives in the Far East. By giving a little more journal area they can safely be loaded up to 30 tons.

There is some difficulty in "clearing" inside hung brake-blocks, but this can be overcome by more careful adjusting. The 2-in. vertical play of the wheel naturally increases the trouble, and one almost suspects that the rigid fixed axle box of the diamond truck was designed to suit the brakes more than the wheels and truck.

The truck illustrated in fig. 1 has the brake worked by a peculiar form of toggle, which, although not theoretically correct, gives very good results in practice. It is hung to a shaft passing through a swing bolster, and is safe, compact and light. The distribution of pressure is practically perfect, owing, no doubt, to the fact that the wheels "give" somewhat under side pressure, thus causing the shaft, when out of adjustment, to become central again, by which means the lower block is prevented from acting as a fulcrum.

The equalizer *B B*, fig. 4, insures the force being equal on each side of the truck, and the numerous points of attachment, bolster hangers, etc., prevent any part being liable to drop upon the track. Fig. 5 illustrates the body bolster, which has been in use several years without any failure. It consists purely of a channel bar trussed with a thin plate, and it readily adapts itself to the employment of *four* sill frames in use with large wheels, which have to work between sills.

Freight Yards.

BY T. APPLETON, C. E.

In the *Railroad Gazette* of May 20 Mr. A. Morrison contributes an article upon the subject of "Division Junctional Yards," a matter in which I take considerable interest. What he lays down as "fundamental principles" in the designing of such yards, is open to criticism. The local conditions and character of business vary so greatly at different points, that nothing but most general principles can be considered universally applicable.

There are some advantages in having freight yards entirely on one side of the main tracks, among which are accessibility to the roundhouse and its appurtenances, and to the repair shops, without crossing main tracks. When yards are on both sides of the main tracks, either the roundhouse, shops, etc., must be duplicated, or many engines and crippled cars must cross the main tracks. Superintendents generally like to get wrecked cars out of sight from the main tracks when undergoing repairs, and this can be more readily accomplished when the yards are entirely upon one side of the main tracks. The principal objection to placing both eastbound and westbound yards on one side of the main tracks is that trains entering in one direction and departing in the other direction must cross one of the main tracks. If there is but a single main track, this objection disappears.

Taking up Mr. Morrison's "fundamental principles in order:

[We reprint Mr. Morrison's specifications for the greater convenience of the reader.—EDITOR.]

1. A site topographically suited for a yard at least twice the length of the longest trains running in the direction the yard is intended for.

2. A yard of such topographical proportions that the proper number of parallel tracks can be obtained within a reasonable outlay for grading, to suit the requirements of the business, usually not to exceed 12 such tracks on each side of the main line.

3. A site where the main line has a grade of about 0.5 per cent., so that cars will run by gravity, for the trains going in one or both directions, preferably the direction the greatest haul of loaded cars is in.

4. A site possible for the construction of a yard on both sides of the main tracks, void of all curves, except those necessary on account of leaders, and especially clear of obstructions for the proper signaling of trains.

5. A site such that the necessary engine-houses, water cranes, coal and ash dumps, sand and oil-houses, also repair shops, can be conveniently located with separate ingress and egress tracks to same.

6. A receiving track at entrance end of yard for all cars designated to pass through the yard, either for sorting or weighing, of sufficient length to accommodate all such trains, without crowding the sorting facilities of the yard, as well as the efficient weighing of the same.

7. The arrangement of the yard so as to make unnecessary the extravagant use of frogs on leaders, or otherwise necessitating curves heavier than 12 degrees; also the absence of all complicated switches, such as double and single slip switches, double crossovers and crossings.

8. The yard to be divided into two parts, so that the sorting yard will have tracks long enough to accommodate the maximum train, and the sorted train yard, tracks to accommodate the maximum outgoing trains, and to have all leaders parallel with each other, so that a uniform length of tracks may be practically obtainable.

9. All tracks parallel and not closer to each other than 12 ft. centres so as to admit of car repair work being done.

10. All frogs, so far as practicable, of the same number, and all switches, preferably point switches, to be made of uniform dimensions.

11. Car repair shops preferably convenient to the receiving end of yard that has the greatest haul of loaded cars, so that all cripple cars can be shifted out and into the repair yard before passing through the main yards, and these shops to have a separate yard for their convenience.

I would say as to No. 1, that tracks as long as the longest train to be hauled are long enough. Why should the tracks be at least twice as long? To No. 2, 12 tracks is about the limit in number of switches that can be conveniently handled, either from a tower or by one switchman on the ground. Yet the number of destinations for cars may be much greater than 12, in which case, as suggested by "A Superintendent," in the *Railroad Gazette* of March 25, 1892, a double ladder, V-shaped, with 12 or 15 tracks on each side, might provide a track for each destination. If this were not sufficient, it might be better to switch the cars into groups of destinations, these groups to be further sorted out at other yards. With principles Nos. 3, 4, 5, 6 and 7, I concur. If the yards were in a basin, with grades pitching both ways toward the centre, the location would be ideal. With a five-tenths grade the average freight car will just hold its speed, which is what is wanted for safe and rapid switching. With a lighter grade the car may not run far enough; with a heavier grade it may attain a dangerous speed. As to principle No. 4, if the main line is in the shape of an offset, that is, with curves in opposite directions, separated by a tangent a mile or a mile and a half in length, the yards can be conveniently planned, without curved tracks or waste space. As to No. 6, a limited number of reception tracks, so that the switchmen have to "hustle" in order to make room for expected incoming trains, will probably result in the

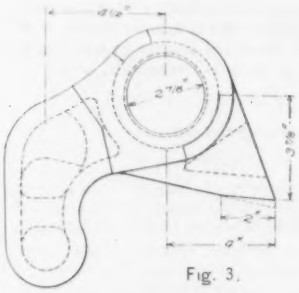


Fig. 3.

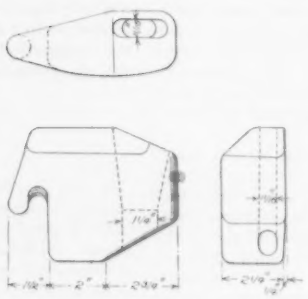


Fig. 5—Weight.

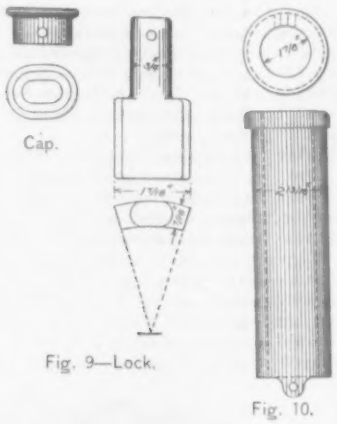


Fig. 9—Lock.

Fig. 10.

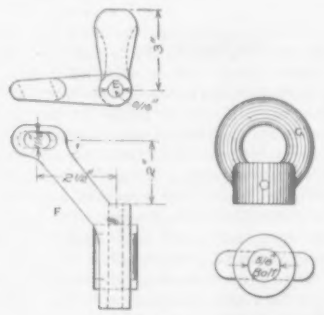


Fig. 8.

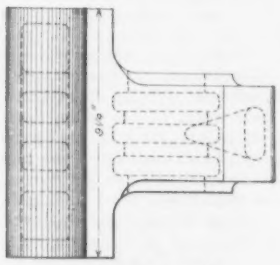


Fig. 4—Knuckle.

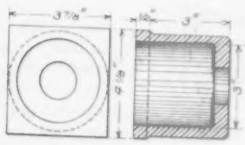


Fig. 6—Spring Pocket.

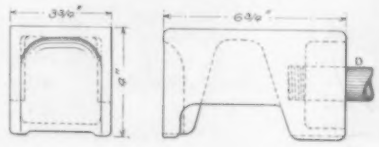


Fig. 7—Plunger.

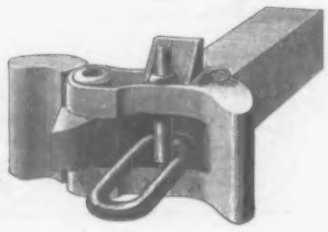
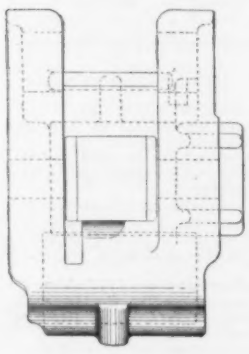


Fig. 11.



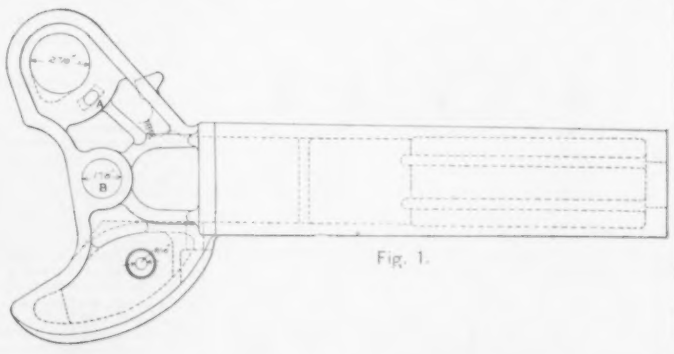


Fig. 1.

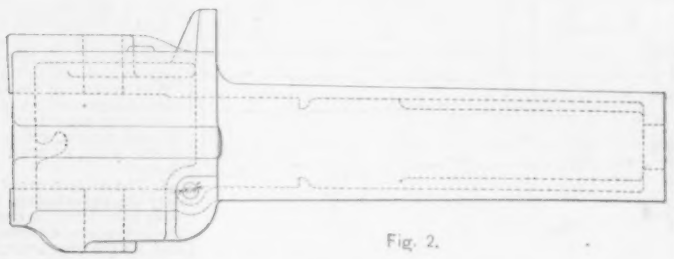


Fig. 2.

PERFECTION AUTOMATIC CAR COUPLER.

STILGER & STROSLER, *Louisville, Ky.*

most expeditious work. With plenty of room in the reception tracks the incentive for quick work is lacking. As to principle No. 7, number seven frogs are largely used; these correspond to 12 degree 30 minute curves. Easier curves and longer frogs require longer leads and thus place the switches further apart on the ladder tracks, keeping the switch tender on the run continually.

As to principle No. 8, why should there be a "sorting yard" and a "sorting train yard?" When a train is "sorted" it should go on to destination. If it is to be held there should be a storage yard. As soon as track is full of cars the train should be removed either by a road engine to its destination or by a switch engine to the storage yard. If the yard is to be divided into two parts shall it be a series of slip crossings which are condemned in principle No. 7? As to No. 9, 12-ft. centres is about as close as tracks can be placed safely. For repairs they should be 20-ft. centres. Cars requiring repairs should be set on repair tracks at once. It is dangerous for the mechanics to attempt repairs on cars in the switching yard. Principle No. 10, O. K. and amen. No. 11 is right in principle, but sometimes difficult to carry out.

Would it not be well to add one more to the list of "fundamental principles"? The switching of cabooses sometimes gives considerable trouble. At each division terminal the engines and cabooses are to return to the point from which they came, while the rest of the train goes on in the same direction in which it arrived. The rule of "first in first out" generally prevails, with cabooses as with crews. It frequently is the case that the crew sleeps in the caboose. The comfort of the men requires that the switching of the caboose be reduced to a minimum. I suggest "principle No. 12," to wit.: Arrange two double ended (not stub) caboose tracks, one for eastbound and one for westbound cabooses, so that each caboose can be switched to its place in order, "first in first out," and be accessible for attaching to its outgoing train. For an example see the Columbus Yard, page 223 of the *Railroad Gazette*, March 25, 1892.

PACKERTON YARD, LEHIGH VALLEY RAILROAD.

Not being familiar with the Lehigh Valley Railroad some things in the diagram of this yard, shown on page 362 of the *Railroad Gazette* are not quite clear. It is presumed that the crossing of the Central Railroad at the throat of the yards is not a grade crossing, also that trains on the Lehigh Valley Railroad run on the right hand track. The absence of a north point, or arrows indicating the direction of the movement of trains or flow of river, renders the plan somewhat obscure. From the context I gather that the grade falls from right to left and that eastbound trains run in the same direction.

The location of repair tracks and shops is such that all crippled cars in eastbound trains have to cross the main tracks to be repaired. Engines of westbound trains have to cross the main track in going to or coming from the roundhouse. Perhaps it might be an improvement to place the Lehigh Valley Railroad main tracks parallel and adjacent to the Central Railroad tracks, running around the roundhouse.

The eastbound yard is very long. Would it not expedite handling of trains to cut it into two separate and distinct yards? The manipulation of trains at this yard involves considerable fly switching, a practice which is usually forbidden "except when unavoidable." An eastbound train coming into the yard, flies the train off from the engine, and the caboose from the train, two flies for each train. To be sure the train is coming down grade so that great speed is not necessary in making these flying switches. Then the eastbound engine has to fly its caboose on to the rear of the train before departing from the yard. How it gets its caboose from the stub caboose track near the roundhouse is not quite clear, but certainly not without considerable switching.

The cars of an incoming train are "carefully inspected as they pass along" before sorting, and again inspected in the yard. It would seem that this inspection "on the run" could not be at all thorough, and that time would be gained if a thorough inspection were made before the train is sorted at all, so that no bad order cars should get into the yard.

CHICAGO, May 30, 1892.

The "Perfection" Car Coupler.

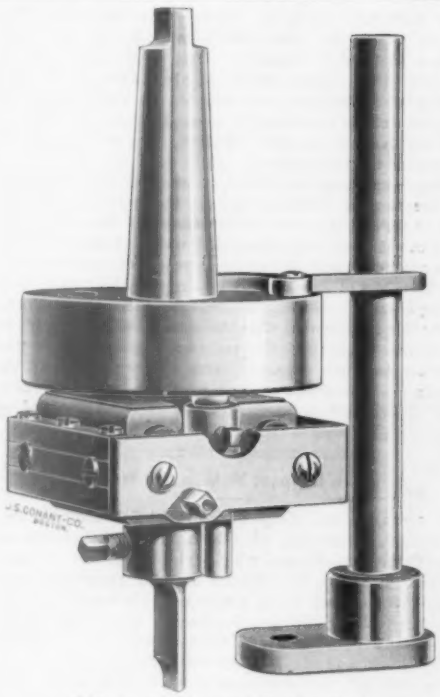
The accompanying cuts show the "Perfection" automatic car coupler, built by Stilger & Strosler, of Louisville, Ky. It is a combination of a link and pin and vertical plane types. When used with a link and pin the knuckle is thrown to one side and held in position by a small pin which passes through the top of the coupler at *A*, fig. 1, and works in a slot in the knuckle. When this pin is down the knuckle can only open to the required amount to be used with the vertical plane coupler. When the pin is raised the knuckle can be swung open to clear a link and pin drawhead, see fig. 11, and the coupling pin when inserted in the pin hole *B* will be held in position by the lock of the knuckle, which is operated by a spring, until the link enters the mouth of the drawhead and pushes the lock out of the way when the coupling pin is allowed to fall, thus making an automatic coupling with a link.

The trunnion of the coupler shown in fig. 10 is large, and has a hole through it of sufficient size to receive a coupling pin, and in service a pin is carried at this point. The coupler lock is square and is moved to and fro in the draw head by a spring, which is held by a piece of pipe, shown at *D*, fig. 7, which is tapped into the back of the lock and passes through the spring pocket fig. 6. The coupler is unlocked by pulling upward on a vertical rod which passes through the arm of a bell crank, shown at *F*, fig. 8. On top of this rod is fastened the eye for the chain, which is shown at *G*. When the plunger is pushed back to unlock the knuckle and the unlocking handle is released the plunger then moves forward and opens the knuckle automatically. The bell crank *F* revolves on a horizontal pin which passes through the hole *E* and through the draw head. There is a weight, fig. 5, which is carried by the rod which passes through the bell crank *F*, and which keeps the bell crank in a locked position and prevents the lock from being driven backward when there is a shock in the train. The lock for holding the knuckle in position when used for link couplers is shown in fig. 9. In other respects this coupler is not unlike other types. It has a pivoted knuckle and a guard arm as usual. Besides the parts shown on the drawing there are also the following: One bolt ⅞ in. × 9¼ in. One bolt ¾ in. × 9¾ in. One piece of 1 in. pipe 6 in. long and one brass coil spring.

A Drill for Polygonal, Oval and Circular Holes.

A novelty in a drill and turning tool is shown by the illustration with this. It is adapted for boring a hole of almost any geometrical figure, such as a round, square, hexagon, octagon, triangle, etc. The tool consists of a drill shank, carrying a cam, which is attached to a cam arm, as shown at the right of the cut. On the end of the drill shank there are a slide bed and a slide carrier with a cam pin, roll and adjusting nuts. As shown, the cam is adapted for boring square holes and variations of such holes. Other cams are provided for other shapes.

This tool can be fitted to any drill or lathe, and is especially useful for counter-boring round holes, as the cutter can be adjusted to bore any size up to 3-in., and can be made to "let in" the heads of square or hexagon bolts and nuts to keep them from turning off. In locomotive work it is well adapted to "let in" bolt heads instead of using dowel pins to prevent them from turning. It requires about five minutes' time to drill a recess for the hexagon head of bolts from ⅜ in. to 1⅛ in. in diameter. For drilling of long holes in expansion plates which are now generally chipped and filed, this tool is well adapted, as the holes made by it are true to size



Polygonal Boring and Turning Tool.

and smooth. The device is known as Smith's polygonal boring and turning tool, and it is sold by the Larabee Machinery Co., Boston, Mass.

A Novel Locomotive Cab—Long Island Railroad.

The accompanying illustration from a photograph shows a locomotive cab extension used on some engines built for the Long Island Railroad Co. by the Cooke Locomotive Works about a year and a half ago. It is to protect the fireman, its use being the outcome of a suit brought against the road by a fireman who was made ill by exposure, the original design of the engine being such as to compel the fireman to stand exposed to the weather at all times when firing. The engine is of the ordinary American type, with Laird cross-heads and guides, and a large firebox, 10 ft. long by 3½ ft. wide.

The general dimensions of the engines are as follows:

Cylinders	17 × 24 in.
Drivers	67. in diameter.
Driving wheel base	8 ft.
Total wheel base	22 ft. 1⅝ in.
Diameter of boiler	52 in.
Weight in working order	90,000 lbs.
Weight on drivers	60,000 "
Weight on truck	30,000 "

The Car Wheel Grinding Machine of the Ensign Manufacturing Co.

For two years the Ensign Manufacturing Company, of Huntington, W. Va., has been using an improved machine for grinding car wheels cast in contracting chills, invented by J. R. Titus, Superintendent of the Foundry Department of those works. The results have proved that great accuracy is attained by this machine, and that one man can handle and grind with its aid as many as 200 wheels in a day.

It consists of a circular body casting, with a section removed so as to admit the wheels to be ground. Resting upon this, and bolted to it, is a spider with three arms, from the centre of which the wheel is suspended in position for being ground. Two of the spider arms are provided with centring rolls, capable of lateral adjustment to suit wheels of different diameters.

The third arm of the spider is provided with a crosshead in which is journaled a vertical shaft carrying at its lower end a friction clutch which bears upon the flange of the car wheel, communicating motion to it during the process of grinding. This vertical shaft is driven by power from a horizontal shaft overhead, with which it connects by bevel gearing.

The emery wheel is encased in a cast iron hood in which is journaled the emery wheel shaft. The hood is also intended as a safeguard against accidents. It is provided with the mechanism to give it vertical and lateral motion, enabling the operator to adapt the machine to wheels of different diameters and widths of tread. It is located on the body casting at a point opposite one of the fixed centring rolls and near the power roll and clutch. This clutch, besides revolving the car-wheel, serves as an elastic point to allow irregularities to pass and, in each revolution, to be acted upon by the emery wheel. The two centring rolls being rigidly adjusted (one directly opposite the emery wheel), they force all irregularities toward the emery wheel and, until the wheel is reduced to an equal diameter at all points and a truly cylindrical form, it will show on its tread the low places untouched.

On one side of the machine a crane is attached to handle the wheels, raising them in and out of the machine, the time occupied in taking a wheel out and putting another in position to be ground being less than one minute. The emery wheel runs continuously, never stopping while changing wheels. This is a great advantage over machines that have to stop and start the emery wheel for every car wheel ground.

The Canda Manufacturing Company, of Carteret, N. J., has adopted this machine for use at its new works.

Electric Train-lighting.

At the meeting of the American Institute of Electrical Engineers, held in Chicago this week, Mr. A. H. Bauer, electrician of the Pullman Car Company, presented a paper on "Railroad Train-lighting," describing the Pullman system. After reviewing the first attempt at train lighting by electricity and the apparatus used, where the motive power was derived from the axle of the car, he says that the reasons for the failure of those plans in this country was due to the universal use of the bogie truck, making it almost impossible to maintain the armature shaft and the axle parallel, and also that the dust and dirt gathered by a moving truck quickly destroyed the mechanism under the car.

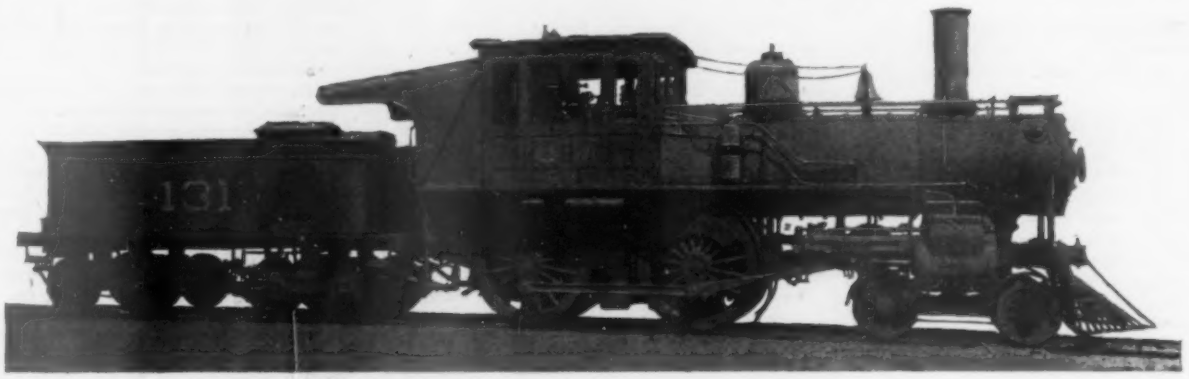
Speaking of storage batteries, Mr. Bauer says that the first attempt to use them was made in 1887-8, on two Pullman trains. The reasons for the failure of these were, first, insufficient capacity of battery, the weight of the batteries being limited to 1,500 lbs.; second, the rapid deterioration of the batteries themselves, due to the constant agitation of the acid solution and the rough usage.

The batteries were of the pasted grid type. It was calculated that the loss incident to one handling of the batteries for recharging was equal to 1,000 miles travel of the car. The paste had a tendency to accumulate in the jar or between the plates, causing short circuits through the cell which resulted in the buckling of the plates, and the destruction of the positive elements in a short time. The improvements in the last five years and more intelligent care in handling have to a certain extent liminated some of the objections and increased the life of the cells. The objection to increasing the capacity of the cells by adding to their size is the great increase of dead weight. It would take 3,000 lbs. of battery for each car. Car lighting with storage batteries has, however, been made successful for one-night runs out of Chicago. The batteries are charged in nine hours with sufficient current for a round trip, the average service being about six hours. It appears from Mr. Bauer's statement that the cost of repairs with the storage battery is exceedingly high, being 10 cts. per lamp per day, based on actual expenditures for five months.

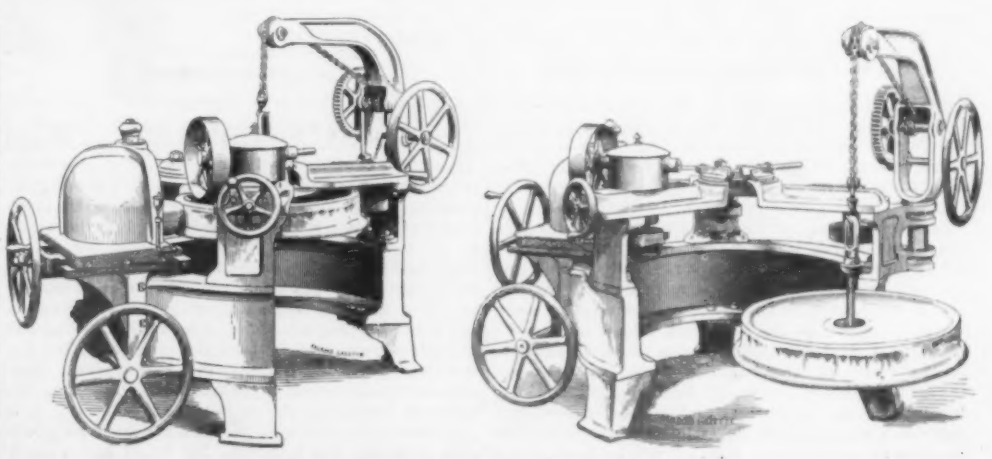
Abandoning this system, the next move was an attempt to drive a dynamo from the axle, and, being unsuccessful, an engine of the vertical single-stroke pattern was placed in the baggage car, connected to the dynamo with a belt and arranged to take steam from the locomotive boiler. This type of engine was abandoned because of the excessive vibration communicated to the car, and a three-cylinder reciprocating engine substituted. This engine is connected with a flexible coupling direct to the dynamo. The plant includes a Brotherhood engine and an Eickemeyer dynamo. This system has been in constant use for five years. The storage battery is used in connection with the engine and dynamo. During the day and that part of the night when but little light is used, the batteries are charged. During that season of the year when most current is used the lamps require about 144 amperes. The batteries supply 44 per cent., or 64 amperes, and the dynamo 80 amperes.

In describing the Pullman Company's experience with various types of dynamos, Mr. Bauer says that short circuits were formed in the armatures by the collection of dust and dirt on the road. There is a percentage of carbon and metal in the dust which collects on the armature and field wires causing short circuits. When the Eickemeyer dynamo was used this trouble was eliminated, the armatures being cleaned every six months. Mr. Bauer describes the equipment of the lighting plant of the baggage car on the Pullman system, and gives some figures as to the capacity of the plant. At 50 lbs. pressure, the dynamo, running at 900 revolutions a minute, generates 80 amperes at 72 volts when all the batteries and lamps are in circuit. Fifty to 75 amperes at 80 to 85 volts are obtainable at the same speed when the batteries alone are in circuit.

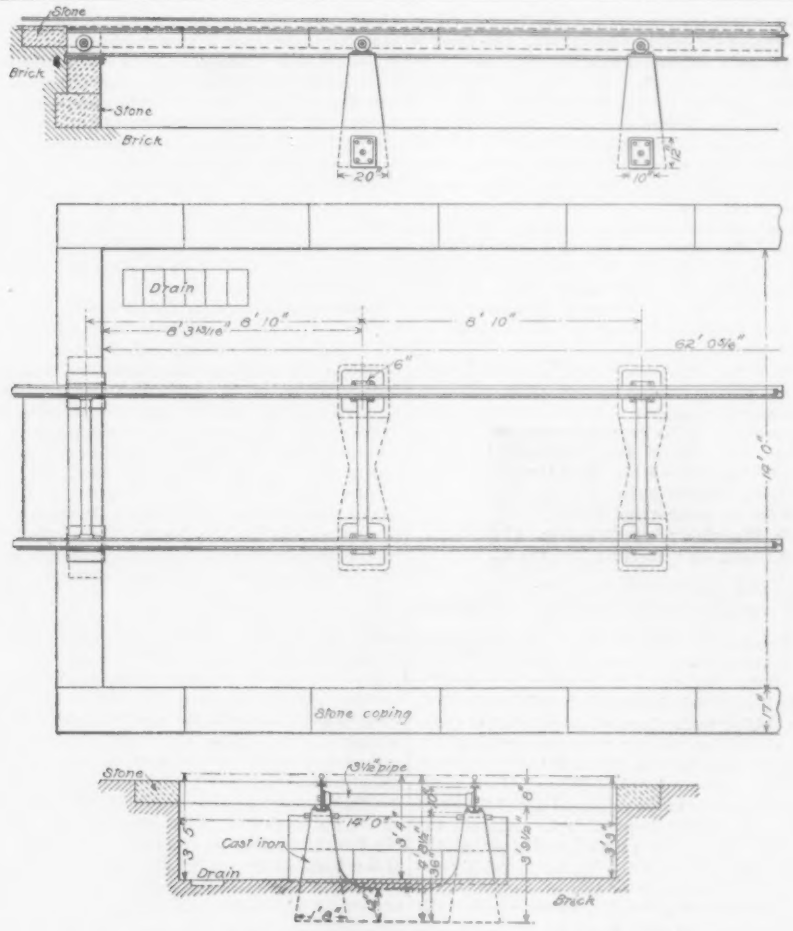
The system of wiring used is the equipotential, or three-wire system. It is so connected that the lamps and batteries are in multiple arc. Should the train be parted or connection with the dynamo be cut off the batteries supply the current necessary to maintain the lights, or should batteries on a certain car become disconnected the batteries on the other cars supply the current. After giving the details of the cost of equipment for a six-car Pullman train there is given a statement of the cost of maintenance from which we copy



A NOVEL LOCOMOTIVE CAB—LONG ISLAND RAILROAD.



Car-Wheel Grinder of the Ensign Manufacturing Company.



ASH PIT—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

the following: The average cost of labor and material for maintaining the lighting of three trains, or 18 cars for 19 months, from August, 1890, to February, 1892, inclusive, was as follows:

Average total cost per month		$1,265.95
" "	per car per day	1.99
" "	of labor per month	712.39
" "	" per car per day	1.11
" "	of material per month	511.51
" "	" per car per day	87
" "	per lamp per day	07.17
Average number of lamps in use		558

The item of labor includes the wages of five attendants on the trains at $3 a day each, and two men at each terminal station at $90 and $55 and $75 and $50 a month respectively. That of material includes the cost of renewal of batteries, etc.

No estimate has been made of the cost of power, as no tests have been made to secure this important item.

In conclusion, Mr. Bauer says that as long as the dynamo can be run and the batteries charged the system is reliable. In extreme cold weather when the locomotive cannot supply steam, the batteries have to do the work and are good for four hours' service.

Locomotive Ash Pit.

An inexpensive and convenient ash pit for locomotives has been devised by Mr. J. N. Barr, of the Chicago, Milwaukee & St. Paul. This pit is shown in the engraving. It is made by mounting on cast iron chairs an eye beam extending the length of the pit and braced by lateral rods with a gas pipe spacer. On top of the eye beams is placed the rail, as shown. There is a stone coping around the edge of the pit which is laid on the brick walls. The bottom of the pit is made of brick and drained in several places. These pits have been in use for some time, and being very serviceable as well as cheap, are now standard on the road.

The St. Louis-Chicago Electric Railroad.

We beg Chicago's pardon for putting the name of St. Louis first in the heading of this article, but as Dr. Wellington Adams' railroad has its fountain in St. Louis, it seems but proper that the names of the cities should appear in the order in which we have placed them.

On the evening of June 2, Dr. Adams addressed the Electric Club in New York on this project. We regret that no representative of the *Railroad Gazette* was present, but the daily newspapers are fairly copious, and we hope tolerably accurate, in reporting the lecture. We are informed by the New York *Times* man that a company of St. Louis capitalists has raised $6,000,000 to build the road, and that "the dream stage of the project is past." If this is is true, Dr. Adams ought not to be lecturing around the country to stimulate further interest in the project, for his estimate of the total cost happens to be this exact sum. It will be remembered that by carefully avoiding all large towns, the cost of right of way is small, and by adhering closely to the natural surface of the ground, regardless of two per cent. grades, the cost of grading will be light. Dr. Adams says that the right of way has been secured for 29 miles out of Chicago and that "we are all right at the St. Louis end." We find in fact, in digging further into the report of the lecture, that over 60 per cent. of the right of way has been acquired. It appears, unless Dr. Adams is wrongly quoted, that the road will carry 3,000,000 World's Fair visitors at $5 a piece for the round trip. Fifteen million dollars gross earnings from this traffic alone, in a year and a half, would pay a very handsome interest on an investment of $6,000,000.

The road bed it seems is to be "sloping, with a porous bottom," but how the porosity is to be secured we are not told. Indeed, there are a good many things that we are not told about this road. When Prof. Forbes regretted that Dr. Adams had not been more explicit as to mechanical details, Dr. Adams explained that he would be happy to enlighten Prof. Forbes further, but that he really feared that he had already said too much, for many of the applications and methods are secret. This suggests the oracular and mysterious Keeleys; both the motor Keeley and the bi-chloride Keeley have won great success by this same policy of secrecy, which some folks think unprofessional.

The line of the proposed road is 248 miles long, and as a uniform speed of 100 miles an hour is to be made, the time of transit between St. Louis and Chicago is two hours and a half. Dr. Adams says, further, "through trains will run to Chicago without stop, at the same rate of speed. Eventually we will have a four-track road, with the two outside tracks for local traffic. The local trains will stop every mile, and will constitute practically a continuous street car service between Chicago and St. Louis." But why there should be local trains stopping every mile on a road that avoids all large towns is not explained.

Foreign Railroad Notes.

The Russian Ministry of Transportation has issued new orders for the regulation of the carriage of cattle by rail. Intending shippers must give notice in writing of the number of cattle they wish to ship, with certificate of a veterinary surgeon that they are sound, and deposit three rubles ($1.50) for every eight head, which is the minimum carload, which will be forfeited if the cattle are not at the station within 48 hours after the notice. From April to October, inclusive, the cattle may be carried in cars with sides but no roofs, in the other months only in covered cars, ventilated by opening the windows and partly opening the doors. For every eight carloads of cattle there must be at least one attendant, but not more than one to a car, to take care of the cattle. Shippers and receivers must do the loading and unloading, the railroads furnishing the necessary conveniences. It is permitted to carry in each car with the cattle an allowance of fodder not exceeding 180 lbs. of hay or straw and 144 lbs. of grain. For three years to come the railroads will be allowed at the rate of 24 hours' time for every 200 miles carried and eight hours for every transfer. The cattle must be unloaded and taken away within 12 hours of their arrival at destination, but may not be driven from the station until a veterinary's permission is obtained. If not taken away as above directed, they will be given in charge of the local police.

The exceptional use of freight cars for carrying grain to the famine districts during the past season, for which service cars were taken from all Russian roads that could spare them, has left the stock in an unusually bad condition, and the needed repairs are said to exceed the facilities of the shops of the roads which have been using the cars. On this account the Minister of Transportation has ordered that the cars needing repairs be distributed among all the railroad repair shops in proportion to their capacity, with instructions that the whole stock be renewed and repaired by next November. These orders apply to the railroads owned by companies as well as to the state railroads.

The Deepest Hole in the World.

Concerning the deep bore-hole at Schladebach, near Ketschan, Germany, of which frequent mention has already been made, and which is now probably the deepest in the world, Mr. Charles Zundel presented some interesting notes in a paper recently read before the Société Industrielle de Mulhouse. The data were obtained directly from Mr. M. Hasslacher, who is in charge of the work, and are, therefore, authoritative.

The hole is 1,748.4 meters, or about 5,735 ft. deep. Boring was commenced in August, 1880, under the direction of the Royal Mines Commission of Prussia in the interests of geological research. Work was continued for 1,247 days, not counting holidays and two long interruptions in 1882 and 1883, and was completed in the autumn of 1886. The average daily rate of boring was, therefore, about 4.59 ft. The total cost of the work was $53,076, representing about $9.25 per foot. The initial diameter of the hole is 280 m. m. (about 11.2 in.), and the drilling apparatus used was of the well-known drop tool form, a casing being carried down as the drilling progressed. At a depth of about 187 ft. this casing would go no further and drilling was, therefore, continued without it. The loose texture of the material passed through, however, showed that a casing was absolutely necessary and a smaller tube, 230 m. m. (9.2 in.) in diameter, was consequently let down.

After a depth of 574 ft. had been reached, boring was continued by means of a diamond drill, 210 m. m. (8.4 in.) in diameter, yielding a core 140 m. m. (5½ in.) in diameter. The size of the hole was decreased at intervals, as the depth increased. At 3,510 ft. it measured only 48 m. m. (1.62 in.) in diameter, and at 5,655 ft. it had decreased to 33 mm. (1.32 in.). It is not to be supposed that the boring had been carried along so far without accidents and consequent delays. As a matter of fact, there had been very many of them which might well have discouraged further progress. Still, the work was continued with much patience. When the depth of 5,735 ft., however, had been attained, there was a succession of discouraging mishaps, and it became evident that further progress could be made only very slowly and at heavy expense. Operations were, therefore, discontinued.

Thermometric measurements in the hole were commenced in 1884 after a depth of 3,936 ft. had been marked, and were repeated at every 30 meters (98½ ft.) further down. These observations were made with much care, and naturally took up considerable time. The thermometers were fixed in a water chamber and this, in turn, was enclosed in a wrought iron casing to prevent breakage of the instruments under the enormous pressure at those depths, due to the water used in clearing out the bore-hole. Three thermometers were used for each reading, the mean of their indications being taken. The thermometers, for each observation, were left in the hole for from 15 to 16 hours. The observations showed that there was a regular, constant increase in temperature with increase in depth. At 5,628 ft. the temperature was 45.3° R. (133.8° Fahr.), and there was an increase of 1° R. for every 46.09 meters (about 151 ft.). From the data thus obtained Mr. Zundel deduced the following formula for calculating the temperature, in degrees Réaumur, at any given depth:

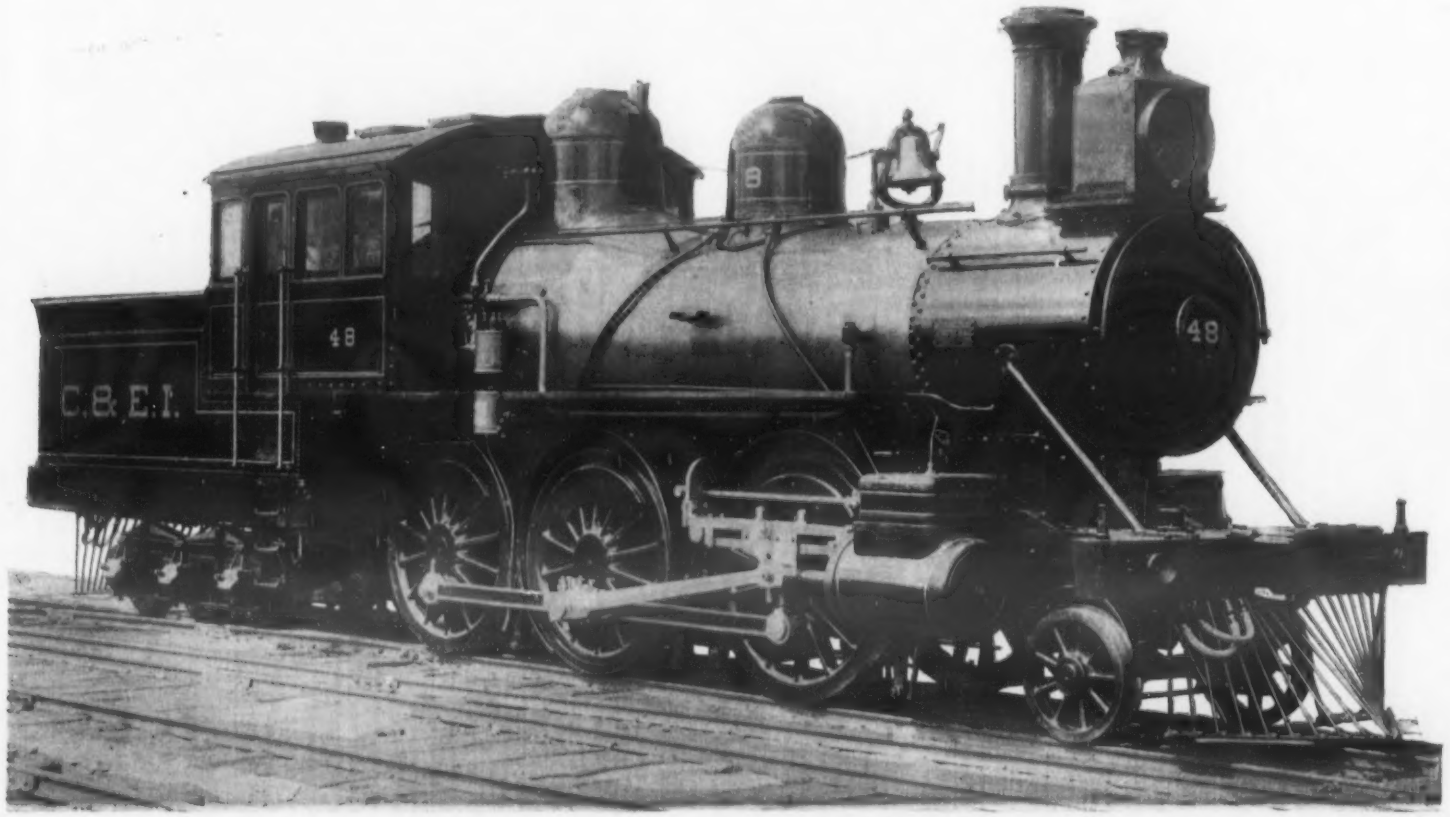
$$R. = 8.3 + \frac{P - 6}{46.09},$$

in which P represents the depths in meters.

Electric Lighting of Trains.

The experiments of the German and Swiss railroads in electric lighting of trains are chiefly with the secondary battery system of the Oerlikon Machine Works. These experiments are attracting considerable attention.

The Oerlikon secondary battery, well known to electricians, contains in place of the usual dilute sulphuric acid, a thick electrolyte consisting of gelatinous silicic acid soaked with dilute sulphuric acid. Such an electrolyte, as may be easily imagined, is of particular advantage in electric train lighting, where the batteries are continually jarred by the motion of the train. A single cell out of order in a battery has been found sufficient to put out the lights in the car supplied by it.

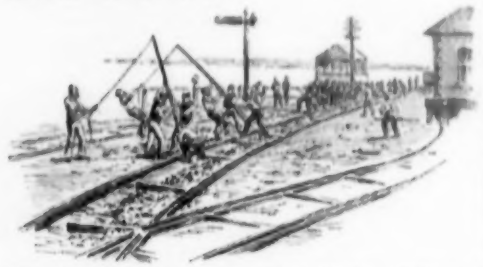


SUBURBAN LOCOMOTIVE FOR THE CHICAGO & EASTERN ILLINOIS.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

total mileage of some 2,500 the Great Western Railway possessed about 120 miles laid with the mixed gauges; from 170 to 200 built solely on the 7-ft. gauge, and the balance wholly of narrow gauge.

Brunel's methods with regard to permanent way structure were based on the theory of a rigid non-elastic road, upon which he ran the heaviest vehicles that had been so far designed for railroad work. He was undoubtedly right in this, when one considers the general design of rolling stock then used; but the modern bogie truck vehicles of great length and considerable weight, probably travel better on a transverse sleeper road with rail joints as flexible as fish plates will allow them to be, than they ever would on the continuous longitudinal sleepers with solid rail joint, employed by Brunel on his broad gauge lines. The latter, therefore, have lost in this respect a great part of such comparative advantages as might be claimed for the system; while the inconvenience of keeping up two separate kinds of rolling stock, and the trouble and expense of transhipment from one to the other, forced the railroad company many years ago to recognize the unfailing doom of their broad gauge line, whatever its intrinsic merit.



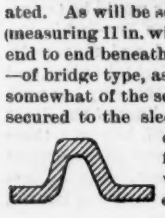
Changing the Gauge of the Great Western Railway of England. Sketch Made at Starcross.

The men seen in the foreground are bringing the rail up to its proper level after its position has been changed. The large gang in the background are slewing the rail and sleeper from the old to the new position. Several transoms already cut off are seen in the foreground.

The operations, just concluded, of converting the gauge have possessed a great deal of interest. This was the last broad gauge in England. It was necessary in carrying out the work to close the line completely to the public for all traffic during the two days in which the work was in progress.

Parts of the line are single track, making additional difficulties. On the portions heretofore converted the principal lengths have been from the outset double track, as, for instance, throughout this company's South Wales district. Here the gauge was altered without completely interrupting the traffic, but it was naturally a work of weeks instead of hours to accomplish this with safety.

On the majority of the mixed gauge lines the usual plan adopted has been to replace the longitudinal sleepers with the ordinary type, transverse to the rails, a third rail being then laid inside, as already stated. It would, of course, have been extremely difficult and expensive to lay down a third longitudinal sleeper, hence the necessity for employing the transverse type, so that bull-head rails might be used with cast iron chairs. The rail adopted by Brunel was a hollow or bridge rail—as will doubtless be remembered—which, of course, is better suited to a continuous sleeper. In view of the details which I propose to give, let me briefly describe the leading characteristics of Brunel's permanent way, so that the labor necessary to alter it can be duly appreciated. As will be seen from the sketches, wood sleepers (measuring 11 in. wide by 6 in. deep) are laid continuously end to end beneath each line of rail; the rails themselves—of bridge type, as stated—have wide flanges, and are somewhat of the section shown in the sketch. They are secured to the sleepers by square-headed bolts—¾ in. diameter—passing through the rail flanges, and screwing into fanged washers on the underside of the sleepers. The fangs of these washers penetrate between the rails and sleepers, so that the former do not bed themselves direct upon the sleepers. The proper cant of the rails is thereby preserved more easily.



The longitudinal sleepers of each line of rails are cross connected by means of stout wood transoms at a distance of every 10 or 12 ft.; these transoms are dovetailed into the sleepers and held tightly in place by wrought iron rods, about 3 ft. long, screwed at one end and flattened out at the other. The rods are spiked or bolted to the sides of the transoms through the flattened ends, the screwed ends passing through the sleeper and being held by means of nuts. At intervals of say every sixth transom a long iron screwed tie rod passes right across from one sleeper to the other, being secured to them by means of nuts also. These rods serve to give the requisite tension or drawing of the rails together, while the transoms act as distance pieces.

The rails at each joint are bedded upon an oblong iron plate (see sketch), measuring about 12 in. long by 7 in. wide, with a rib an inch thick running down the centre lengthways. This rib fits into the hollow ends of the bridge rails and so prevents side play.

The plates are slotted out for ¾-in. bolts, somewhat as shown, and they certainly give a remarkably stiff joint.

As has been said, the cost of putting down a third longitudinal sleeper to "mix" the gauges would have been excessive, and the wisdom of such a step more than doubtful. The simplest thing to do was to cut the transoms to suit a 4-ft. 8½ in. track, take out the tie rods on the one side—with all the long ones also—and slew or push the continuous sleeper and rail inward as far as necessary. The obstacle to this method was the fact that a great part of the line along the shore and among the hills (where the gradients and viaduct works are both heavy) consisted only of one pair of rails, so that the whole traffic would be stopped during the alterations.

Although the company is busily engaged in double tracking the line as fast as possible, it was at length decided that the continued inconvenience and expense of breaking gauge at numerous points made it necessary to alter the gauge at once even at the cost of stopping traffic for awhile.

Saturday and Sunday last were therefore chosen for the work, and on Friday evening at 5 p. m. I left London in the last broad gauge train to pay a visit to the scene of operations.

Great regret appeared to be shown by all the railroad people at the final abolition of the system, as though they were witnessing the death of an old and well tried servant. However, it is probably a case of "Le Roi est Mort; Vive le Roi," for the standard gauge trains certainly seem to run no whit less easily than the old broad gauge, in fact personal experience would lead me to prefer the former.

all with the traffic, and perhaps two-thirds of the transoms cut through in readiness for taking out the pieces. The first duty of the men therefore on starting work—with the traffic stopped and the lines all clear—was to shorten all the transoms and remove the tie rods. Then followed the "muscle" work, slewing the rail inwards. This looked less laborious than it was, and the gangs of fifteen or twenty men who did the work fully appreciated the buckets of oatmeal and boiling water supplied them to drink.

By noon on Sunday all the main lines were altered, ready for traffic; and the pilot engine and van on which I accompanied the division engineer over one of the worst parts of the line to deal with, ran as steadily and as smoothly as could be wished.

By Sunday evening, after 31 working hours, the lines were everywhere ready for trains, and traffic was resumed on Monday morning as usual, a standard gauge train being then able for the first time to run right through the line from Penzance in Cornwall, to Paddington—the London terminus of the company. The

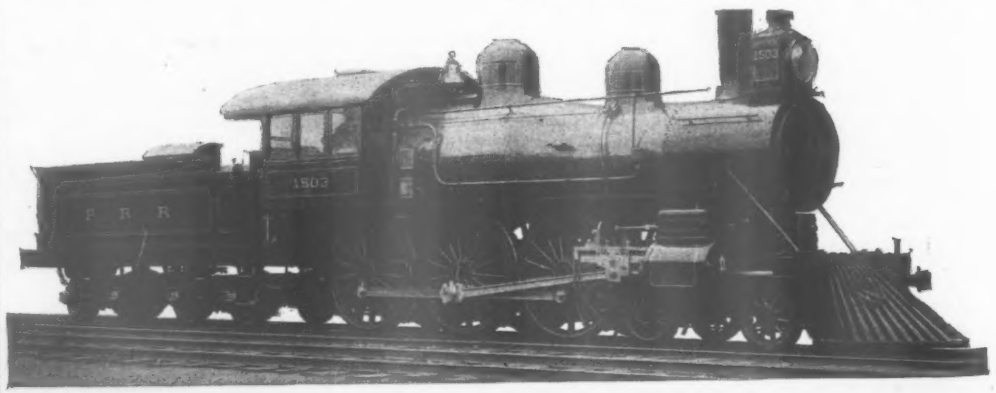
Changing the Gauge of the Great Western Railway. Sketch Made Between Starcross and Exminster.

The left hand track is broad gauge and the other has been narrowed. The workmen are rough-ballasting the track.

enormous bulk of early vegetables, fish and similar freight sent from the southwest of England will now have a free vent throughout the North and East, without requiring transhipment. The importance of this traffic has been a potent factor in deciding the company to alter the gauge.

Passenger traffic in the opposite direction—southward to the Devonshire and Cornish watering places—will also be fostered by better through time.

Several other points possess interest; for instance, advantage was taken of the fact that the line would be narrowed to ease the curves here and there, where it was possible to do it by shifting the rails first on one side then on the other. The island platforms at the chief stations had also to be widened by the amount of



TWO-CYLINDER COMPOUND PASSENGER LOCOMOTIVE FOR THE PENNSYLVANIA RAILROAD.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

tance were ordered to be ready to leave home on Thursday, the 19th, with sufficient food to last them until the 24th, though the company furnished oat meal and hot water for them on the ground, and "through the kindness of Mr. W. H. Wills, one of the directors," each man received two ounces of tobacco. Some of the men slept in freight houses, and the company furnished each with two rugs and a bag filled with straw. The men were paid the regular ordinary and overtime rates for the hours they worked, and for the time they were away from home received 25 per cent. additional, besides one shilling per man for each night he was away from home.

On Friday the men worked their regular hours, making preparations, changing side tracks, etc. Monday was occupied in ballasting and clearing up the tools. On Tuesday the men were drafted back to their respective districts, and as might be expected from the tension of work during the previous two or three days, were somewhat jovial at quite an early hour. Their conduct, however, taken altogether, deserved every possible praise, and the engineers in charge may be congratulated on the way in which they got the work done.

F. H. L.

Schenectady Locomotives for the Pennsylvania.

The two locomotives shown on the opposite page were designed and built by the Schenectady Locomotive Works for the Pennsylvania Railroad. They are intended for service on the divisions between Philadelphia and Pittsburgh, and to haul the New York & Chicago limited trains. We have mentioned the fact before that the Pennsylvania has, within a few months, ordered several new locomotives of various types and different makers for trial in its fast and hard service. The two which are shown to-day belong to this lot of engines.

As will be seen by the engravings and description, the boilers are of the extension wagon top style, the crown sheet being supported by radial stays. The boiler plate is $\frac{5}{16}$ in. and $\frac{7}{16}$ in. thick, the horizontal seams being butt welted. The boilers are designed for carrying 180 lbs. working pressure.

The driving springs on both engines are hung underneath the driving boxes. All the driving wheels and engine and tender truck wheels have Krupp tires held by retaining rings. The driving boxes are of solid Ajax metal.

GENERAL DIMENSIONS.

	Eight-wheel simple passenger.	Ten-wheel compound passenger.
Fuel	Bituminous coal.	Bituminous coal.
Gauge	4 ft. 9 in.; ¾ in. play.	4 ft. 9 in.; ¾ in. play.
Weight on drivers	81,000 lbs.	102,000 lbs.
" trucks	42,000 "	36,000 "
" total	123,000 "	138,000 "
Wheel base, driving.	8 ft.	13 ft. 2 in.
" " rigid	8 ft.	6 ft. 9 in.
" " total	23 ft. 5 in.	23 ft. 11 in.
Diam. of cylinder	19 ins.	H. P. 30 in. L. P. L. H. 20 in. H. P.
Stroke of piston	24 in.	24 in.
Size of steam ports	18 in. × 1⅝ in.	L. P. 21 in. × 2⅛ in H. P. 19 " × 2⅛ "
" exhaust "	18 " × 3 "	L. P. 21 " × 3 " H. P. 19 " × 3 "
Travel of slide valve	5½ in.	6½ in.
Lap "	outside ⅞ " inside.	1⅛ in.
Clearance "	inside.	L. P. 1 in. H. P. ⅝ "
Kind "	Allen Richardson, balanced.	Allen Richardson, balanced.
Diam. of driving wheels outside of tire	78 in.	74 in.
Diam. and length of driv. axle journals	8½ in. × 11 in.	8 in. × 10 in.
Diam. Eng. truck wheels	36 in.	33 in.
Diam. and length of Eng. truck axle journals	6 in. × 10 in.	5½ in. × 9 in.

Fig. 3.

The Hodges Steel Construction Applied to Car Details.

Working pressure of boiler	180 lbs.	180 lbs.
Style of boiler	Extended wagon top	Extended wagon top.
Diam. of first ring outside	58 in.	58 in.
Size of firebox length	96⅜ in.	96⅜ in.
" " width	39¼ "	39¼ "
" " depth	F. 70¾ " R. 61⅜ "	F. 69¾ " B. 60¾ "
Water space all around	4 in.	4 in.
Crown supported by	1 in. radial stays.	1 in. radial stays.
Tubes, material	Charcoal iron No. 11.	Charcoal iron No. 11
" No. of	269	268
" dia. and length	2 in. × 12 ft.	2 in. × 13 ft.
Heating surface, tubes	1,672.2 sq. ft.	1,811.5 sq. ft.
" " firebox	144.3 "	141.7 "
" " total	1,816.5 "	1,953.2 "
Grate surface	26.2 "	26.2 "
Throttle	Balanced valves, Double poppet.	Balanced valves, Double poppet.
	Tender.	
Wt. of tender, empty	42,000 lbs.	42,000 lbs.
Number of wheels	8	8
Diameter of wheels	36 in.	36 in.
Diameter and length of journals	4½ in. × 8 in.	4½ in. × 8 in.
Total wheel base of tender	16 ft. 2 in.	16 ft. 2 in.
Style of tender frame	Channel iron.	Channel iron.
Style of tender truck	S. L. W. standard four-wheel channel iron bolster, centre bearing front and back, with additional side bearings on back truck.	S. L. W. standard four-wheel channel iron bolster, centre bearing front and back, with additional side bearings on back truck.
Water capacity	3,500 galls.	3,500 galls.
Coal capacity	8 tons.	8 tons.

The Hodges Plan of Steel Construction.

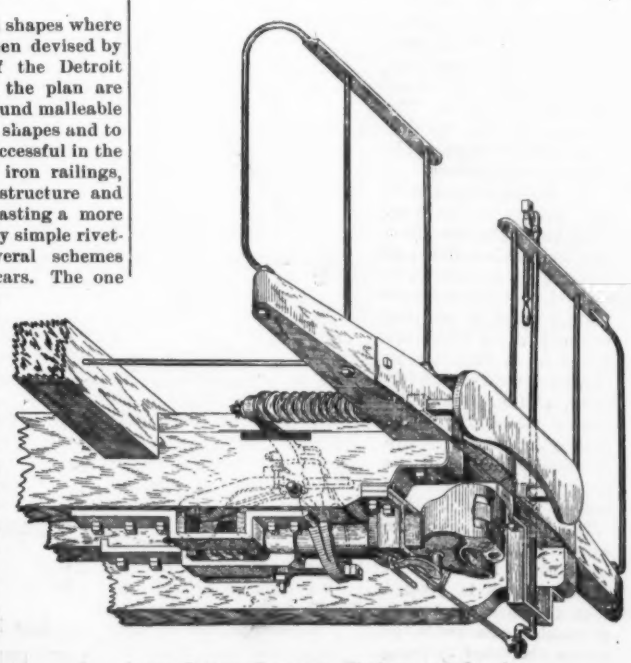
An ingenious method of joining rolled shapes where they cross each other at any angle has been devised by Mr. H. C. Hodges, of Detroit, President of the Detroit Lubricator Company. The elements of the plan are shown in fig. 1. They consist of a compound malleable iron casting adapted to fit the two rolled shapes and to be bolted to them. The plan has proved successful in the joints of pipe roof trusses and for angle iron railings, and has now been adapted for the superstructure and sills of freight cars. By the compound casting a more secure joint is obtained than can be had by simple riveting. Mr. Hodges has designed several schemes for adapting the construction to freight cars. The one here shown is the latest and the best he has devised. There are several types of sills; some made of Z bars, others of channels and angles. These are shown in figs. 2, 3, 4 and 5. Fig. 6 shows how the transverse plates are riveted to the sills. The construction of rolled shapes having a "U" section, for roof, is shown in fig. 7. In connection with this method of joining rolled shapes Mr. Hodges has devised a car of unusual length having a central truck. The truck is of special design made from rolled shapes, and while it is heavy and somewhat expensive, it has a high carrying capacity. The roof is covered with corrugated iron with the corrugations spaced so as to correspond with the sections of "U" shaped iron shown in fig. 7.

Janney-Buhoup Passenger Coupler and Buffer.

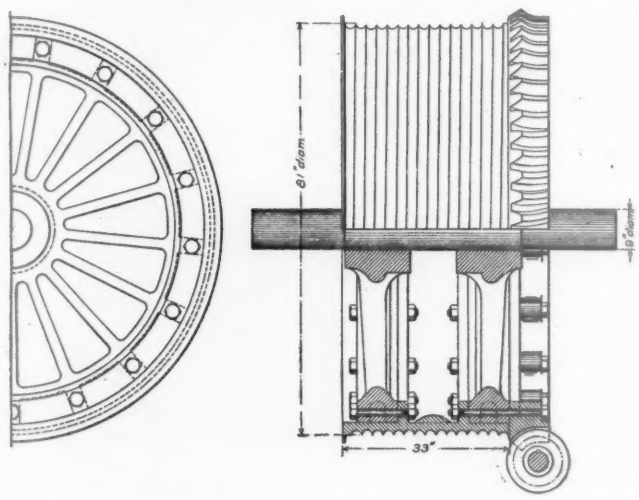
In the *Railroad Gazette*, Jan. 22, 1892, Buhoup's vestibule equalizer device was described as being one which caused an increase of pressure to be brought upon the face plates of the vestibules whenever the cars were pressed together or pulled apart. The mechanism which brought about this action is adapted as well for use on cars that have not the vestibule, and the arrangement of the parts for such use is shown by the illustration with this. It will be noticed that the arrangement of parts is identical with that for vestibules with the exception that in the one here shown the bell cranks and connections for the top of the vestibule are removed. Perhaps a better understanding of the mechanism will be had if the reader will refer to the illustrations of the vestibule mechanism as above as well as to the illustration now given.

Attached to the regular Janney platform there is what is called a "kicker." It is an arm extending ahead from the rear follower plate to a vertical lever, with a yoke at the bottom end surrounding the drawbar. The lever is pivoted above the drawbar. At the bottom end of the lever there is a connecting rod extending to the drawbar strap, as shown. Whenever the drawbar is pulled out the "kicker" presses on the vertical lever above its fulcrum, and forces out the chafing plate, as is evident from the construction shown. Also, the chafing plate is forced out whenever the drawbar is pushed in, as then the connecting rod pulls on the lower end of the vertical lever, and forces the upper end of that lever forward, carrying with it the chafing plate. In this way it matters not whether the drawbar is pushed in or pulled out, the chafing plates are pressed together in either case. This is an obvious advantage, as it prevents the chafing plates from separating, and keeps them always bearing together, thus holding the cars steady when the engine is pulling out hard.

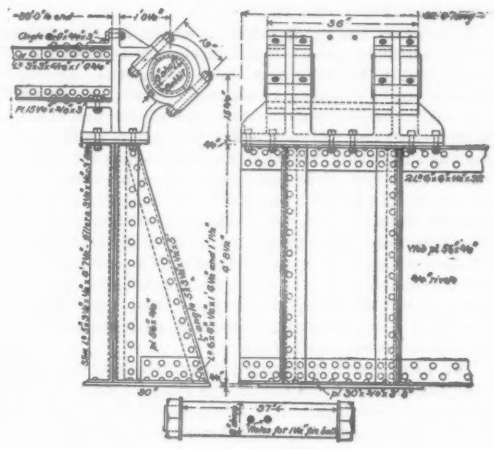
Some of the advantages claimed for this buffer are



Janney-Buhoup Passenge Platform and Coupler.



WINDING DRUM—HARLEM LIFT BRIDGE.



Hinge and Pin.

that it gives a positive spring pressure on the buffers at all times; it is strong and easily repaired; it can be converted for the Janney-Miller combination buffer without changing the timbers; it can be uncoupled from the ground or from the platform, as may be most convenient.

This buffer and coupler is made by the McConway & Torley Co., Pittsburgh, Pa.

Lift Bridge Over the Harlem River.

The illustrations show an ingenious lift bridge put in by the New York Central & Hudson River Railroad over the Harlem River at 135th street and Fourth avenue, New York City. The bridge at this point is used by about 500 passenger trains daily, and any interruption is therefore of very serious consequence. Some months ago a steamboat ran against the pivot draw and damaged it considerably. Neither railroad nor river traffic was interrupted, but the incident showed the importance of maintaining the integrity of this crossing, and the officers of the road at once decided to have an auxiliary or emergency draw, and the structure here shown was decided upon. It takes the place of the former fixed span south of the pivot draw, and in the ordinary course of traffic will not have to be lifted.

The bridge in question consists of a double-track plate girder span, 92 ft. 6 in. long, and 28 ft. in width, pivoted at its southerly end. This span was constructed in place, on piles driven in the channel, closing it temporarily. The bridge is hinged on two pins, 8 in. in diameter and 37 in. long, fixed in the two outer girders and journaling in two double hinges attached to the abutments, as shown in the engraving. The tower from which the bridge is operated is 127 ft. 9 in. in height, and is constructed of latticed posts thoroughly braced.

The lifting is done by two double 2-in. steel cables. These cables pass around a sheave at the outer end of the bridge, thence up and over a sheave on the tower, 77 ft. 6 in. above the ground, thence down to the lifting drums on the 28-ft. level, thence upward over a sheave at the extreme top of the tower and down inside the posts, where the counterbalance weights are attached. The sheave on the outer end of the bridge is 2 ft. in diameter and is intended merely to equalize the strain on the cables. The other sheaves are 6 ft. 10 in. in diameter, and are made of old locomotive driving wheels, the rims being grooved to take the cables, as shown. The centres of the winding drums are also made of old driving wheel centres.

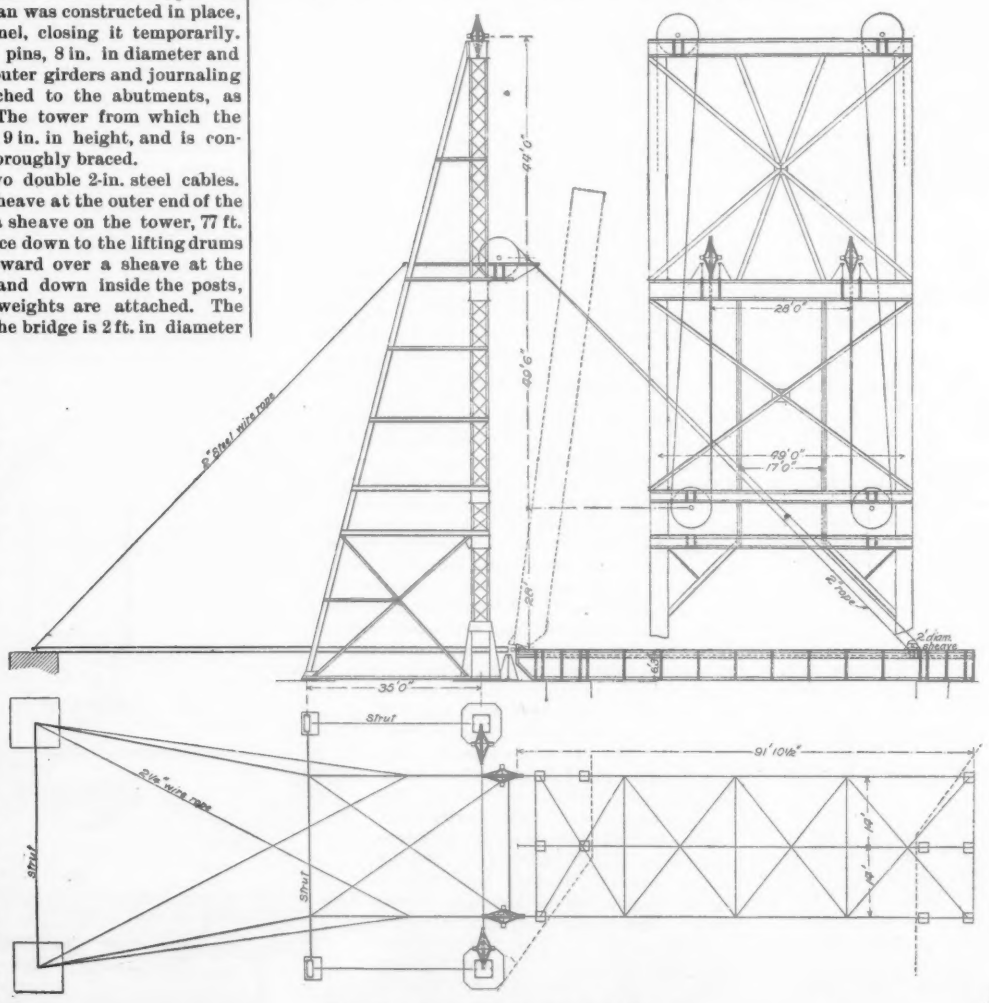
The lifting engine is of the horizontal pattern, with two cylinders, 10 × 14¼ in., taking steam at 80 lbs. initial pressure. The main shaft extends across the tower and operates the winding drums, which are 6 ft. 9 in. in diameter, by two worms, right and left hand, of 4-in. pitch. The cables make 1½ turns around the drums, and five revolutions of the drums are required to lift the bridge.

The arrangement of the counterweights is rather ingenious. Each set of these weights is divided into 23 stages, the lowest of which is attached to the cables, the other 22 being free, the cables passing through a slot in their centres. When the bridge is raised to a vertical position only the last weight is in action, all the others being suspended in the towers on catches of varying widths, bolted to the sides of the weights. These catches engage on brackets of angle iron, projecting from the interior of the towers, spaced to match the catches on the weights. Each weight has four rubber buffers to lessen the shock when picked up. As the bridge is lowered the weights are picked up in succession until when it is in its horizontal position all are in action and raised to the top of the tower. As the bridge is raised the process is reversed. The total weight of the counterweights is 90 tons. The arrangement of the angles in the interior of the tower for the support of the weights is shown in the engraving.

Mr. G. H. Thomson, Engineer of Bridges of the New York Central & Hudson River, designed the structure, and Mr. John D. Wilkins, Assistant Engineer, is responsible for the details of the machinery. The cost of the bridge was about $40,000. Messrs. Cofrode & Saylor were contractors for the bridge and structure, and the Union Wire Rope and Tramway Co. for the cables and machinery, which were put in place by that company's superintendent, Mr. S. A. Cooney.

Among the advantages of an end lift draw that of time required for a vessel to pass the opening is worthy of consideration. For instance, the time of passage of a vessel through an end lift draw will be the time required to cover a distance equal to the width of the bridge plus the length of the boat, whereas to pass a pivot draw the distance to be covered is the length of the draw plus the length of the boat. When only one opening is to be provided for, an end lift draw is certainly cheaper than a pivot draw. The motion of the end lift draw is under perfect control. This bridge has been lowered at various speeds, producing no perceptible shock at low speed and not much at high speed.

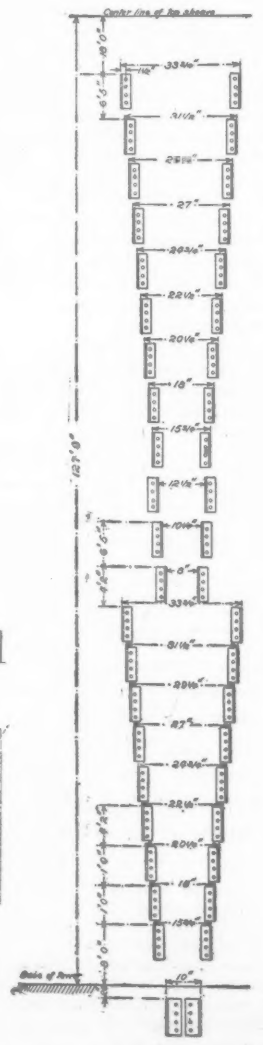
This bridge has been described as a temporary draw, but it is hardly accurate to speak of it in that way. It has been decided to remove the present double track bridge at this crossing, and to construct in place of it a four-track bridge with a clear height of 24 ft. above the water, some 18 ft. higher than the present level, and the new bridge is to be located on the same site as the old. To do this, a temporary bridge will have to be built west of the present line, to carry the trains during the construction of the high level bridge, and the days of the present bridge, with its two draws, are therefore numbered; but the lift draw is permanent in the same sense that the pivot draw adjoining it is permanent. In the high level bridge an emergency draw will be of far less importance, if not almost useless, as nothing but the spars and upper works of vessels can damage the trusses.



Side Elevation, Front Elevation and Plan.

LIFT BRIDGE OVER THE HARLEM RIVER.

New York Central & Hudson River Railroad.



Stops for Counterweights.

A Chinese Freight Car Truck.

The accompanying cuts illustrate a new form of truck designed by Mr. C. W. Kinder for use on railroads in China, which is now adopted there as standard. The description and comments are essentially in Mr. Kinder's language. It can be made by native workmen almost as cheaply as the ordinary diamond trucks, "Thielsen" type, which are imported from America, besides having many advantages. It does not compare with the "Fox" stamped frames for lightness, although it is not very far behind, while it possesses the great advantage of being easily and truly made by natives, has the best running qualities, and is easily repaired.

The characteristics of the truck are big wheels, laminated springs, over journal boxes, with every reasonable effort made to insure the frame being kept "square" in order that the high class wheels may get a fair chance to do high duty. The mileage obtained under these conditions from 42½-in. steel-tired wheels in many cases reaches 200,000 without turning the wheels, although, no doubt, the absence of heavy grades and sharp curves has much to do with this long life. The average wheel is probably more often ruined by neglect to keep it properly centred than by anything else.

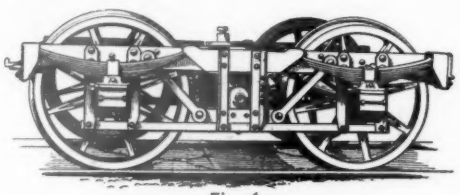


Fig. 1.

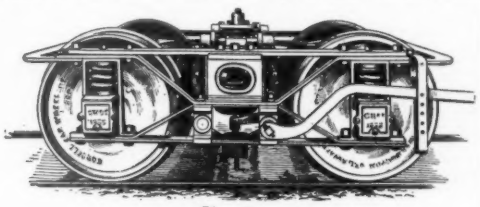


Fig. 2.

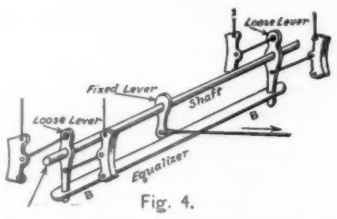


Fig. 4.

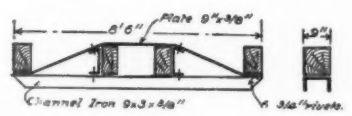


Fig. 5.

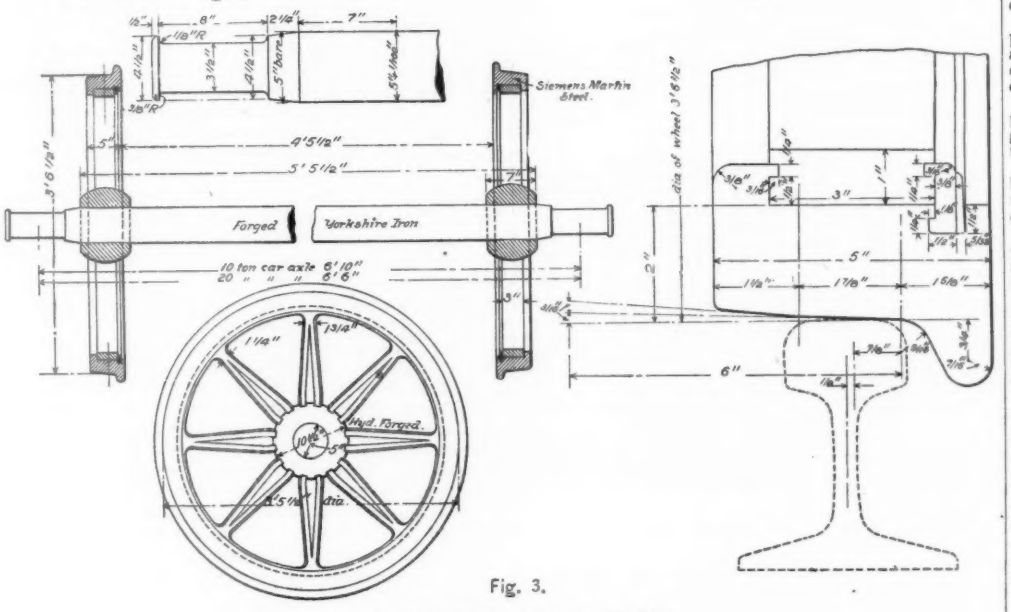


Fig. 3.

A CHINESE FREIGHT CAR TRUCK.

The frame of this truck consists of two 6 in. × 1 in. steel slabs braced at both ends by angle irons, and attached to the truck bolster by four angle irons, which are firmly riveted to the channel irons which compose it. A channel swing bolster is employed on all trucks, as the cars are liable at any time to be used for transport of troops and calvary horses.

The weight of the truck complete is 3½ tons, each wheel weighing 769 lbs.; each axle 441 lbs.; each spring 134 lbs., and each journal box (with Macnee's patent oiler) 113½ lbs. The journal boxes have cast iron packing rings—which are "sprung up" against the wheel boss to exclude dust. These have superseded the Beuther, which had a paper dust shield which gave out rapidly in the climate of China.

Both 33-in. and 36-in. wheels of the same type are in use, but do not give such good results as regards wear and smooth running, to say nothing of "tractive" qualities, and saving of track joints.

The laminated springs are cheaper in first cost and in maintenance, as they last for an indefinite period if soaked in oil about once in every three years. They also ride much smoother than coil springs.

The parts are assembled on a cast iron erecting block, with horns to grip the axle guards and bolster channels. The riveting is thus done under circumstances which render it impossible to get the frame out of true, and no setting out is required.

The adoption of 42½-in. steel-tired wheels for all rolling stock will no doubt appear an extravagant notion, but in point of fact, when freight and local circumstances are considered, they are the cheapest, beside being the best, for use in China. The cost of four wheels and two axles, f. o. b., averages £23. The accompanying cut, fig. 3, shows the dimensions and mode of attachment of the tire, which is now adopted for locomotives as well as cars.

A number of 33-in. and 36 in. cast iron wheels are in use, and also some of Krupp steel; but there is no doubt that until such can be made and "remade" in China there is no economy in their use. Where labor is cheap there may be serious doubts about their employment, for in America it is only the high price of steel-tired wheels which gives the chilled variety a victory. A longer wheel base (5 ft. 6 in.) is used on the Chinese roads, as much of the flange wear is no doubt due to excessive shortness of trucks. In recent coaches in America 8 ft. and 9 ft. wheel bases are now adopted, which a few years ago would have caused expressions of horror. In fact, most of the best modern 10 and 12-ton four-wheel stock does very well on an 8-ft. base.

The cost of the trucks in use on the Chinese roads, complete with brake rigging, is about the same as the imported Thielsen diamond truck, with 36-in. chilled wheels and timber swing bolster; but a great saving is consequently made in freight.

The cars are intended for 20 long tons, but they often carry as much as 24 tons without any difficulty. They are unusually strong, as indeed all things must be which are worked by natives in the Far East. By giving a little more journal area they can safely be loaded up to 30 tons.

There is some difficulty in "clearing" inside hung brake-blocks, but this can be overcome by more careful adjusting. The 2-in. vertical play of the wheel naturally increases the trouble, and one almost suspects that the rigid fixed axle box of the diamond truck was designed to suit the brakes more than the wheels and truck.

The truck illustrated in fig. 1 has the brake worked by a peculiar form of toggle, which, although not theoretically correct, gives very good results in practice. It is hung to a shaft passing through a swing bolster, and is safe, compact and light. The distribution of pressure is practically perfect, owing, no doubt, to the fact that the wheels "give" somewhat under side pressure, thus causing the shaft, when out of adjustment, to become central again, by which means the lower block is prevented from acting as a fulcrum.

The equalizer *B B*, fig. 4, insures the force being equal on each side of the truck, and the numerous points of attachment, bolster hangers, etc., prevent any part being liable to drop upon the track. Fig. 5 illustrates the body bolster, which has been in use several years without any failure. It consists purely of a channel bar trussed with a thin plate, and it readily adapts itself to the employment of *four* sill frames in use with large wheels, which have to work between sills.

Freight Yards.

BY T. APPLETON, C. E.

In the *Railroad Gazette* of May 20 Mr. A. Morrison contributes an article upon the subject of "Division Junctional Yards," a matter in which I take considerable interest. What he lays down as "fundamental principles" in the designing of such yards, is open to criticism. The local conditions and character of business vary so greatly at different points, that nothing but most general principles can be considered universally applicable.

There are some advantages in having freight yards entirely on one side of the main tracks, among which are accessibility to the roundhouse and its appurtenances, and to the repair shops, without crossing main tracks. When yards are on both sides of the main tracks, either the roundhouse, shops, etc., must be duplicated, or many engines and crippled cars must cross the main tracks. Superintendents generally like to get wrecked cars out of sight from the main tracks when undergoing repairs, and this can be more readily accomplished when the yards are entirely upon one side of the main tracks. The principal objection to placing both eastbound and westbound yards on one side of the main tracks is that trains entering in one direction and departing in the other direction must cross one of the main tracks. If there is but a single main track, this objection disappears.

Taking up Mr. Morrison's "fundamental principles in order:

[We reprint Mr. Morrison's specifications for the greater convenience of the reader.—EDITOR.]

1. A site topographically suited for a yard at least twice the length of the longest trains running in the direction the yard is intended for.

2. A yard of such topographical proportions that the proper number of parallel tracks can be obtained within a reasonable outlay for grading, to suit the requirements of the business, usually not to exceed 12 such tracks on each side of the main line.

3. A site where the main line has a grade of about 0.5 per cent., so that cars will run by gravity, for the trains going in one or both directions, preferably the direction the greatest haul of loaded cars is in.

4. A site possible for the construction of a yard on both sides of the main tracks, void of all curves, except those necessary on account of leaders, and especially clear of obstructions for the proper signaling of trains.

5. A site such that the necessary engine-houses, water cranes, coal and ash dumps, sand and oil-houses, also repair shops, can be conveniently located with separate ingress and egress tracks to same.

6. A receiving track at entrance end of yard for all cars designated to pass through the yard, either for sorting or weighing, of sufficient length to accommodate all such trains, without crowding the sorting facilities of the yard, as well as the efficient weighing of the same.

7. The arrangement of the yard so as to make unnecessary the extravagant use of frogs on leaders, or otherwise necessitating curves heavier than 12 degrees; also the absence of all complicated switches, such as double and single slip switches, double crossovers and crossings.

8. The yard to be divided into two parts, so that the sorting yard will have tracks long enough to accommodate the maximum train, and the sorted train yard, tracks to accommodate the maximum outgoing trains, and to have all leaders parallel with each other, so that a uniform length of tracks may be practically obtainable.

9. All tracks parallel and not closer to each other than 12 ft. centres so as to admit of car repair work being done.

10. All frogs, so far as practicable, of the same number, and all switches, preferably point switches, to be made of uniform dimensions.

11. Car repair shops preferably convenient to the receiving end of yard that has the greatest haul of loaded cars, so that all cripple cars can be shifted out and into the repair yard before passing through the main yards, and these shops to have a separate yard for their convenience.

I would say as to No. 1, that tracks as long as the longest train to be hauled are long enough. Why should the tracks be at least twice as long? To No. 2, 12 tracks is about the limit in number of switches that can be conveniently handled, either from a tower or by one switchman on the ground. Yet the number of destinations for cars may be much greater than 12, in which case, as suggested by "A Superintendent," in the *Railroad Gazette* of March 25, 1892, a double ladder, V-shaped, with 12 or 15 tracks on each side, might provide a track for each destination. If this were not sufficient, it might be better to switch the cars into groups of destinations, these groups to be further sorted out at other yards. With principles Nos. 3, 4, 5, 6 and 7, I concur. If the yards were in a basin, with grades pitching both ways toward the centre, the location would be ideal. With a five-tenths grade the average freight car will just hold its speed, which is what is wanted for safe and rapid switching. With a lighter grade the car may not run far enough; with a heavier grade it may attain a dangerous speed. As to principle No. 4, if the main line is in the shape of an offset, that is, with curves in opposite directions, separated by a tangent a mile or a mile and a half in length, the yards can be conveniently planned, without curved tracks or waste space. As to No. 6, a limited number of reception tracks, so that the switchmen have to "hustle" in order to make room for expected incoming trains, will probably result in the

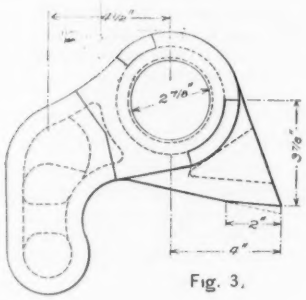


Fig. 3.

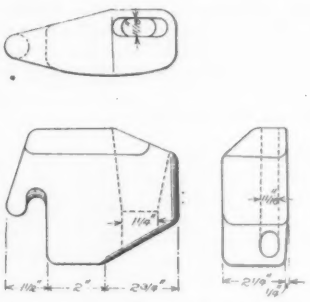


Fig. 5—Weight.

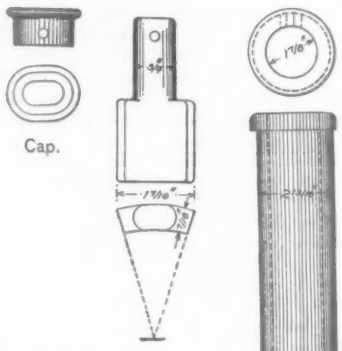


Fig. 9—Lock.

Fig. 10.

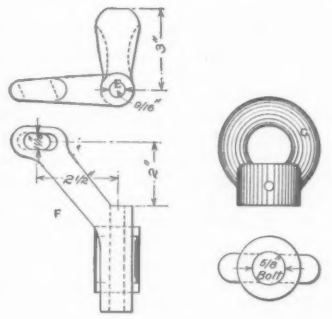


Fig. 8.

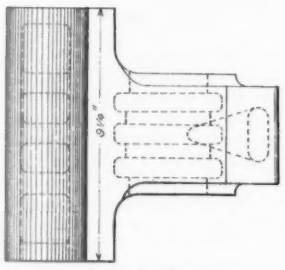


Fig. 4—Knuckle.

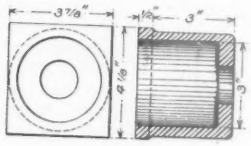


Fig. 6—Spring Pocket.

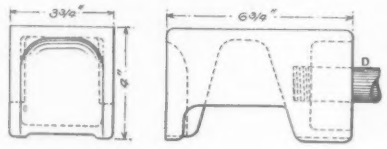


Fig. 7—Plunger.

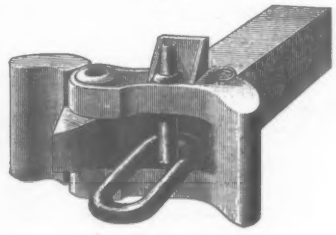
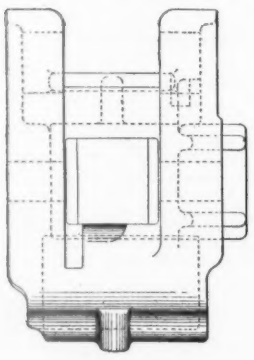


Fig. 11.



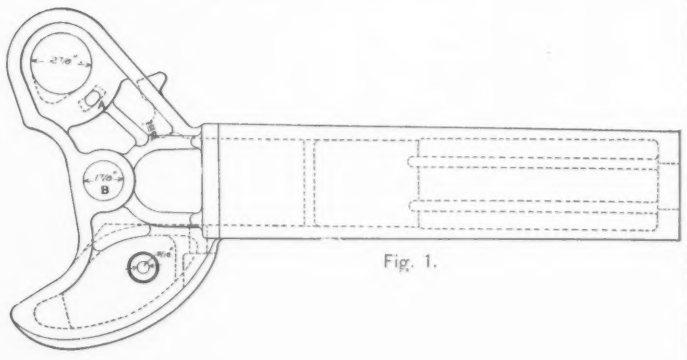


Fig. 1.

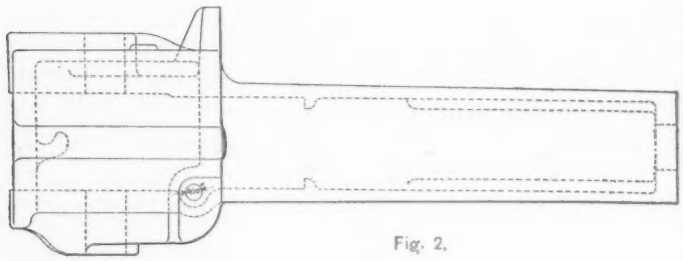


Fig. 2.

PERFECTION AUTOMATIC CAR COUPLER.

STILGER & STROSLER, *Louisville, Ky.*

most expeditious work. With plenty of room in the reception tracks the incentive for quick work is lacking. As to principle No. 7, number seven frogs are largely used; these correspond to 12 degree 30 minute curves. Easier curves and longer frogs require longer leads and thus place the switches further apart on the ladder tracks, keeping the switch tender on the run continually.

As to principle No. 8, why should there be a "sorting yard" and a "sorting train yard?" When a train is "sorted" it should go on to destination. If it is to be held there should be a storage yard. As soon as track is full of cars the train should be removed either by a road engine to its destination or by a switch engine to the storage yard. If the yard is to be divided into two parts shall it be a series of slip crossings which are condemned in principle No. 7? As to No. 9, 12-ft. centres is about as close as tracks can be placed safely. For repairs they should be 20-ft. centres. Cars requiring repairs should be set on repair tracks at once. It is dangerous for the mechanics to attempt repairs on cars in the switching yard. Principle No. 10, O. K. and amen. No. 11 is right in principle, but sometimes difficult to carry out.

Would it not be well to add one more to the list of "fundamental principles"? The switching of cabooses sometimes gives considerable trouble. At each division terminal the engines and cabooses are to return to the point from which they came, while the rest of the train goes on in the same direction in which it arrived. The rule of "first in first out" generally prevails, with cabooses as with crews. It frequently is the case that the crew sleeps in the caboose. The comfort of the men requires that the switching of the caboose be reduced to a minimum. I suggest "principle No. 12," to wit.: Arrange two double ended (not stub) caboose tracks, one for eastbound and one for westbound cabooses, so that each caboose can be switched to its place in order, "first in first out," and be accessible for attaching to its outgoing train. For an example see the Columbus Yard, page 223 of the *Railroad Gazette*, March 25, 1892.

PACKERTON YARD, LEHIGH VALLEY RAILROAD.

Not being familiar with the Lehigh Valley Railroad some things in the diagram of this yard, shown on page 362 of the *Railroad Gazette* are not quite clear. It is presumed that the crossing of the Central Railroad at the throat of the yards is not a grade crossing, also that trains on the Lehigh Valley Railroad run on the right hand track. The absence of a north point, or arrows indicating the direction of the movement of trains or flow of river, renders the plan somewhat obscure. From the context I gather that the grade falls from right to left and that eastbound trains run in the same direction.

The location of repair tracks and shops is such that all crippled cars in eastbound trains have to cross the main tracks to be repaired. Engines of westbound trains have to cross the main track in going to or coming from the roundhouse. Perhaps it might be an improvement to place the Lehigh Valley Railroad main tracks parallel and adjacent to the Central Railroad tracks, running around the roundhouse.

The eastbound yard is very long. Would it not expedite handling of trains to cut it into two separate and distinct yards? The manipulation of trains at this yard involves considerable fly switching, a practice which is usually forbidden "except when unavoidable." An eastbound train coming into the yard, flies the train off from the engine, and the caboose from the train, two flies for each train. To be sure the train is coming down grade so that great speed is not necessary in making these flying switches. Then the eastbound engine has to fly its caboose on to the rear of the train before departing from the yard. How it gets its caboose from the stub caboose track near the roundhouse is not quite clear, but certainly not without considerable switching.

The cars of an incoming train are "carefully inspected as they pass along" before sorting, and again inspected in the yard. It would seem that this inspection "on the run" could not be at all thorough, and that time would be gained if a thorough inspection were made before the train is sorted at all, so that no bad order cars should get into the yard.

CHICAGO, May 30, 1892.

The "Perfection" Car Coupler.

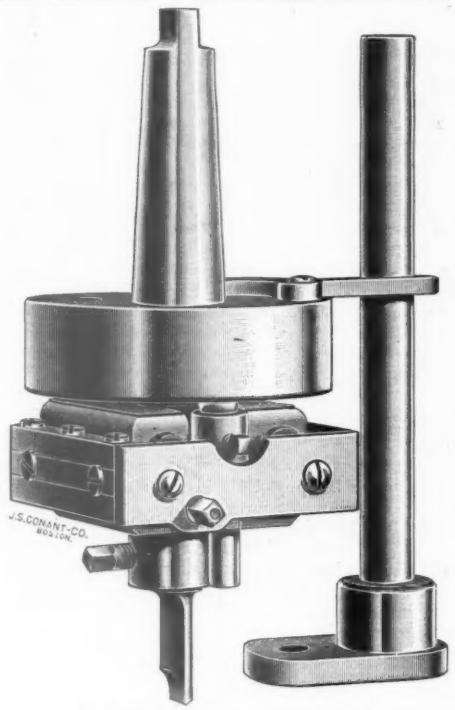
The accompanying cuts show the "Perfection" automatic car coupler, built by Stilger & Strosler, of Louisville, Ky. It is a combination of a link and pin and vertical plane types. When used with a link and pin the knuckle is thrown to one side and held in position by a small pin which passes through the top of the coupler at *A*, fig. 1, and works in a slot in the knuckle. When this pin is down the knuckle can only open to the required amount to be used with the vertical plane coupler. When the pin is raised the knuckle can be swung open to clear a link and pin drawhead, see fig. 11, and the coupling pin when inserted in the pin hole *B* will be held in position by the lock of the knuckle, which is operated by a spring, until the link enters the mouth of the drawhead and pushes the lock out of the way when the coupling pin is allowed to fall, thus making an automatic coupling with a link.

The trunnion of the coupler shown in fig. 10 is large, and has a hole through it of sufficient size to receive a coupling pin, and in service a pin is carried at this point. The coupler lock is square and is moved to and fro in the draw head by a spring, which is held by a piece of pipe, shown at *D*, fig. 7, which is tapped into the back of the lock and passes through the spring pocket fig. 6. The coupler is unlocked by pulling upward on a vertical rod which passes through the arm of a bell crank, shown at *F*, fig. 8. On top of this rod is fastened the eye for the chain, which is shown at *G*. When the plunger is pushed back to unlock the knuckle and the unlocking handle is released the plunger then moves forward and opens the knuckle automatically. The bell crank *F* revolves on a horizontal pin which passes through the hole *E* and through the draw head. There is a weight, fig. 5, which is carried by the rod which passes through the bell crank *F*, and which keeps the bell crank in a locked position and prevents the lock from being driven backward when there is a shock in the train. The lock for holding the knuckle in position when used for link couplers is shown in fig. 9. In other respects this coupler is not unlike other types. It has a pivoted knuckle and a guard arm as usual. Besides the parts shown on the drawing there are also the following: One bolt ⅛ in. × 9¼ in. One bolt ½ in. × 9¾ in. One piece of 1 in. pipe 6 in. long and one brass coil spring.

A Drill for Polygonal, Oval and Circular Holes.

A novelty in a drill and turning tool is shown by the illustration with this. It is adapted for boring a hole of almost any geometrical figure, such as a round, square, hexagon, octagon, triangle, etc. The tool consists of a drill shank, carrying a cam, which is attached to a cam arm, as shown at the right of the cut. On the end of the drill shank there are a slide bed and a slide carrier with a cam pin, roll and adjusting nuts. As shown, the cam is adapted for boring square holes and variations of such holes. Other cams are provided for other shapes.

This tool can be fitted to any drill or lathe, and is especially useful for counter-boring round holes, as the cutter can be adjusted to bore any size up to 3-in., and can be made to "let in" the heads of square or hexagon bolts and nuts to keep them from turning off. In locomotive work it is well adapted to "let in" bolt heads instead of using dowel pins to prevent them from turning. It requires about five minutes' time to drill a recess for the hexagon head of bolts from ⅜ in. to 1⅛ in. in diameter. For drilling of long holes in expansion plates which are now generally chipped and filed, this tool is well adapted, as the holes made by it are true to size



Polygonal Boring and Turning Tool.

and smooth. The device is known as Smith's polygonal boring and turning tool, and it is sold by the Larabee Machinery Co., Boston, Mass.

A Novel Locomotive Cab—Long Island Railroad.

The accompanying illustration from a photograph shows a locomotive cab extension used on some engines built for the Long Island Railroad Co. by the Cooke Locomotive Works about a year and a half ago. It is to protect the fireman, its use being the outcome of a suit brought against the road by a fireman who was made ill by exposure, the original design of the engine being such as to compel the fireman to stand exposed to the weather at all times when firing. The engine is of the ordinary American type, with Laird cross-heads and guides, and a large firebox, 10 ft. long by 3½ ft. wide.

The general dimensions of the engines are as follows:

Cylinders	17 × 24 in.
Drivers	67. in diameter.
Driving wheel base	8 ft.
Total wheel base	22 ft. 1⅝ in.
Diameter of boiler	52 in.
Weight in working order	90,000 lbs.
Weight on drivers	60,000 "
Weight on truck	30,000 "

The Car Wheel Grinding Machine of the Ensign Manufacturing Co.

For two years the Ensign Manufacturing Company, of Huntington, W. Va., has been using an improved machine for grinding car wheels cast in contracting chills, invented by J. R. Titus, Superintendent of the Foundry Department of those works. The results have proved that great accuracy is attained by this machine, and that one man can handle and grind with its aid as many as 200 wheels in a day.

It consists of a circular body casting, with a section removed so as to admit the wheels to be ground. Resting upon this, and bolted to it, is a spider with three arms, from the centre of which the wheel is suspended in position for being ground. Two of the spider arms are provided with centring rolls, capable of lateral adjustment to suit wheels of different diameters.

The third arm of the spider is provided with a crosshead in which is journaled a vertical shaft carrying at its lower end a friction clutch which bears upon the flange of the car wheel, communicating motion to it during the process of grinding. This vertical shaft is driven by power from a horizontal shaft overhead, with which it connects by bevel gearing.

The emery wheel is encased in a cast iron hood in which is journaled the emery wheel shaft. The hood is also intended as a safeguard against accidents. It is provided with the mechanism to give it vertical and lateral motion, enabling the operator to adapt the machine to wheels of different diameters and widths of tread. It is located on the body casting at a point opposite one of the fixed centring rolls and near the power roll and clutch. This clutch, besides revolving the car-wheel, serves as an elastic point to allow irregularities to pass and, in each revolution, to be acted upon by the emery wheel. The two centring rolls being rigidly adjusted (one directly opposite the emery wheel), they force all irregularities toward the emery wheel and, until the wheel is reduced to an equal diameter at all points and a truly cylindrical form, it will show on its tread the low places untouched.

On one side of the machine a crane is attached to handle the wheels, raising them in and out of the machine, the time occupied in taking a wheel out and putting another in position to be ground being less than one minute. The emery wheel runs continuously, never stopping while changing wheels. This is a great advantage over machines that have to stop and start the emery wheel for every car wheel ground.

The Canda Manufacturing Company, of Carteret, N. J., has adopted this machine for use at its new works.

Electric Train-lighting.

At the meeting of the American Institute of Electrical Engineers, held in Chicago this week, Mr. A. H. Bauer, electrician of the Pullman Car Company, presented a paper on "Railroad Train-lighting," describing the Pullman system. After reviewing the first attempt at train-lighting by electricity and the apparatus used, where the motive power was derived from the axle of the car, he says that the reasons for the failure of those plans in this country was due to the universal use of the bogie truck, making it almost impossible to maintain the armature shaft and the axle parallel, and also that the dust and dirt gathered by a moving truck quickly destroyed the mechanism under the car.

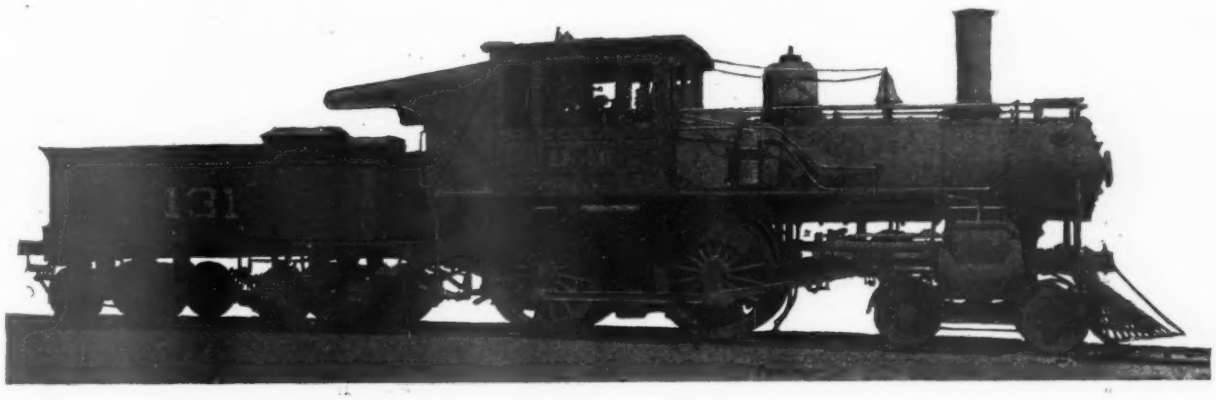
Speaking of storage batteries, Mr. Bauer says that the first attempt to use them was made in 1887-8, on two Pullman trains. The reasons for the failure of these were, first, insufficient capacity of battery, the weight of the batteries being limited to 1,500 lbs.; second, the rapid deterioration of the batteries themselves, due to the constant agitation of the acid solution and the rough usage.

The batteries were of the pasted grid type. It was calculated that the loss incident to one handling of the batteries for recharging was equal to 1,000 miles travel of the car. The paste had a tendency to accumulate in the jar or between the plates, causing short circuits through the cell which resulted in the buckling of the plates, and the destruction of the positive elements in a short time. The improvements in the last five years and more intelligent care in handling have to a certain extent liminated some of the objections and increased the life of the cells. The objection to increasing the capacity of the cells by adding to their size is the great increase of dead weight. It would take 3,000 lbs. of battery for each car. Car lighting with storage batteries has, however, been made successful for one-night runs out of Chicago. The batteries are charged in nine hours with sufficient current for a round trip, the average service being about six hours. It appears from Mr. Bauer's statement that the cost of repairs with the storage battery is exceedingly high, being 10 cts. per lamp per day, based on actual expenditures for five months.

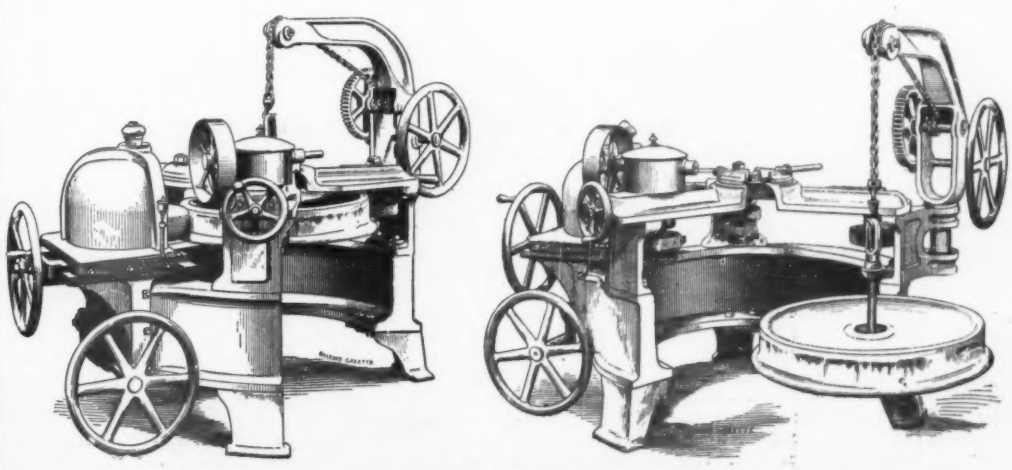
Abandoning this system, the next move was an attempt to drive a dynamo from the axle, and, being unsuccessful, an engine of the vertical single-stroke pattern was placed in the baggage car, connected to the dynamo with a belt and arranged to take steam from the locomotive boiler. This type of engine was abandoned because of the excessive vibration communicated to the car, and a three-cylinder reciprocating engine substituted. This engine is connected with a flexible coupling direct to the dynamo. The plant includes a Brotherhood engine andan Eickemeyer dynamo. This system has been in constant use for five years. The storage battery is used in connection with the engine and dynamo. During the day and that part of the night when but little light is used, the batteries are charged. During that season of the year when most current is used the lamps require about 144 ampères. The batteries supply 44 per cent., or 64 ampères, and the dynamo 80 ampères.

In describing the Pullman Company's experience with various types of dynamos, Mr. Bauer says that short circuits were formed in the armatures by the collection of dust and dirt on the road. There is a percentage of carbon and metal in the dust which collects on the armature and field wires causing short circuits. When the Eickemeyer dynamo was used this trouble was eliminated, the armatures being cleaned every six months. Mr. Bauer describes the equipment of the lighting plant of the baggage car on the Pullman system, and gives some figures as to the capacity of the plant. At 50 lbs. pressure, the dynamo, running at 900 revolutions a minute, generates 80 ampères at 72 volts when all the batteries and lamps are in circuit. Fifty to 75 ampères at 80 to 85 volts are obtainable at the same speed when the batteries alone are in circuit.

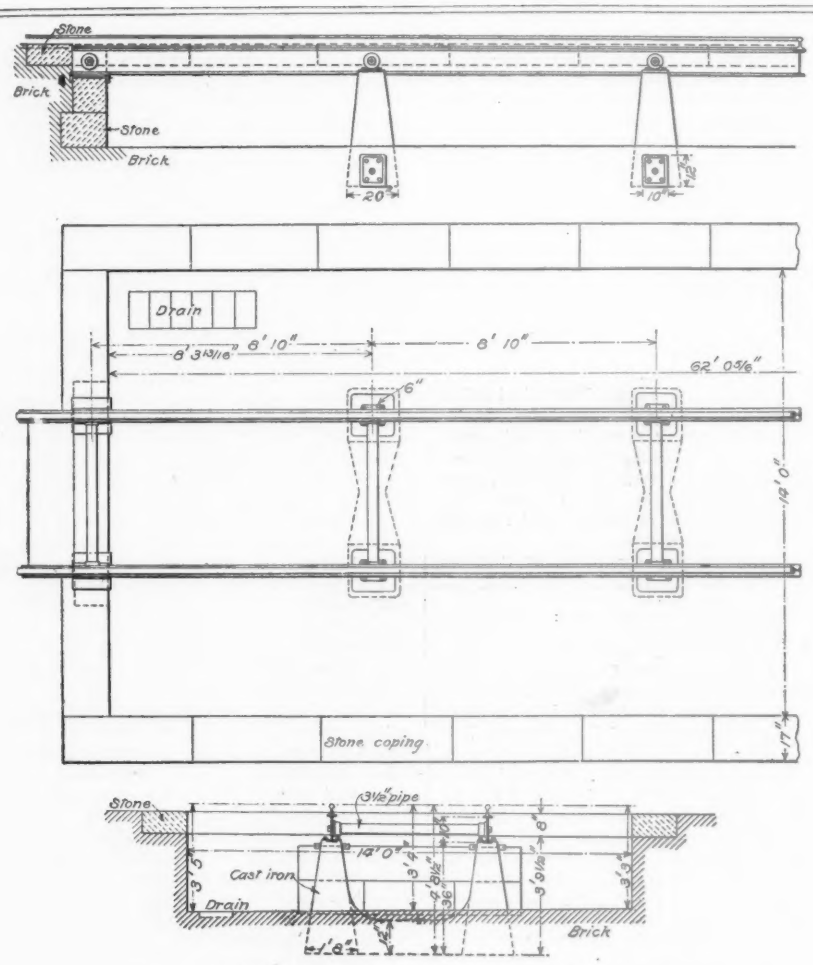
The system of wiring used is the equipotential, or three-wire system. It is so connected that the lamps and batteries are in multiple arc. Should the train be parted or connection with the dynamo be cut off the batteries supply the current necessary to maintain the lights, or should batteries on a certain car become disconnected the batteries on the other cars supply the current. After giving the details of the cost of equipment for a six-car Pullman train there is given a statement of the cost of maintenance from which we copy



A NOVEL LOCOMOTIVE CAB—LONG ISLAND RAILROAD.



Car-Wheel Grinder of the Ensign Manufacturing Company.



ASH PIT—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

the following: The average cost of labor and material for maintaining the lighting of three trains, or 18 cars for 19 months, from August, 1890, to February, 1892, inclusive, was as follows:

Average total cost per month		$1,265.95
" "	per car per day	1.99
" "	of labor per month	712.39
" "	" per car per day	1.11
" "	of material per month	511.51
" "	" per car per day	87
" "	per lamp per day	07.17
Average number of lamps in use		558

The item of labor includes the wages of five attendants on the trains at $3 a day each, and two men at each terminal station at $90 and $55 and $75 and $50 a month respectively. That of material includes the cost of renewal of batteries, etc.

No estimate has been made of the cost of power, as no tests have been made to secure this important item.

In conclusion, Mr. Bauer says that as long as the dynamo can be run and the batteries charged the system is reliable. In extreme cold weather when the locomotive cannot supply steam, the batteries have to do the work and are good for four hours' service.

Locomotive Ash Pit.

An inexpensive and convenient ash pit for locomotives has been devised by Mr. J. N. Barr, of the Chicago, Milwaukee & St. Paul. This pit is shown in the engraving. It is made by mounting on cast iron chairs an eye beam extending the length of the pit and braced by lateral rods with a gas pipe spacer. On top of the eye beams is placed the rail, as shown. There is a stone coping around the edge of the pit which is laid on the brick walls. The bottom of the pit is made of brick and drained in several places. These pits have been in use for some time, and being very serviceable as well as cheap, are now standard on the road.

The St. Louis-Chicago Electric Railroad.

We beg Chicago's pardon for putting the name of St. Louis first in the heading of this article, but as Dr. Wellington Adams' railroad has its fountain in St. Louis, it seems but proper that the names of the cities should appear in the order in which we have placed them.

On the evening of June 2, Dr. Adams addressed the Electric Club in New York on this project. We regret that no representative of the *Railroad Gazette* was present, but the daily newspapers are fairly copious, and we hope tolerably accurate, in reporting the lecture. We are informed by the New York *Times* man that a company of St. Louis capitalists has raised $6,000,000 to build the road, and that "the dream stage of the project is past." If this is is true, Dr. Adams ought not to be lecturing around the country to stimulate further interest in the project, for his estimate of the total cost happens to be this exact sum. It will be remembered that by carefully avoiding all large towns, the cost of right of way is small, and by adhering closely to the natural surface of the ground, regardless of two per cent. grades, the cost of grading will be light. Dr. Adams says that the right of way has been secured for 29 miles out of Chicago and that "we are all right at the St. Louis end." We find in fact, in digging further into the report of the lecture, that over 60 per cent. of the right of way has been acquired. It appears, unless Dr. Adams is wrongly quoted, that the road will carry 3,000,000 World's Fair visitors at $5 a piece for the round trip. Fifteen million dollars gross earnings from this traffic alone, in a year and a half, would pay a very handsome interest on an investment of $6,000,000.

The road bed it seems is to be "sloping, with a porous bottom," but how the porosity is to be secured we are not told. Indeed, there are a good many things that we are not told about this road. When Prof. Forbes regretted that Dr. Adams had not been more explicit as to mechanical details, Dr. Adams explained that he would be happy to enlighten Prof. Forbes further, but that he really feared that he had already said too much, for many of the applications and methods are secret. This suggests the oracular and mysterious Keeleys; both the motor Keeley and the bi-chloride Keeley have won great success by this same policy of secrecy, which some folks think unprofessional.

The line of the proposed road is 248 miles long, and as a uniform speed of 100 miles an hour is to be made, the time of transit between St. Louis and Chicago is two hours and a half. Dr. Adams says, further, "through trains will run to Chicago without stop, at the same rate of speed. Eventually we will have a four-track road, with the two outside tracks for local traffic. The local trains will stop every mile, and will constitute practically a continuous street car service between Chicago and St. Louis." But why there should be local trains stopping every mile on a road that avoids all large towns is not explained.

Foreign Railroad Notes.

The Russian Ministry of Transportation has issued new orders for the regulation of the carriage of cattle by rail. Intending shippers must give notice in writing of the number of cattle they wish to ship, with certificate of a veterinary surgeon that they are sound, and deposit three rubles ($1.50) for every eight head, which is the minimum carload, which will be forfeited if the cattle are not at the station within 48 hours after the notice. From April to October, inclusive, the cattle may be carried in cars with sides but no roofs, in the other months only in covered cars, ventilated by opening the windows and partly opening the doors. For every eight carloads of cattle there must be at least one attendant, but not more than one to a car, to take care of the cattle. Shippers and receivers must do the loading and unloading, the railroads furnishing the necessary conveniences. It is permitted to carry in each car with the cattle an allowance of fodder not exceeding 180 lbs. of hay or straw and 144 lbs. of grain. For three years to come the railroads will be allowed at the rate of 24 hours' time for every 200 miles carried and eight hours for every transfer. The cattle must be unloaded and taken away within 12 hours of their arrival at destination, but may not be driven from the station until a veterinary's permission is obtained. If not taken away as above directed, they will be given in charge of the local police.

The exceptional use of freight cars for carrying grain to the famine districts during the past season, for which service cars were taken from all Russian roads that could spare them, has left the stock in an unusually bad condition, and the needed repairs are said to exceed the facilities of the shops of the roads which have been using the cars. On this account the Minister of Transportation has ordered that the cars needing repairs be distributed among all the railroad repair shops in proportion to their capacity, with instructions that the whole stock be renewed and repaired by next November. These orders apply to the railroads owned by companies as well as to the state railroads.

The Deepest Hole in the World.

Concerning the deep bore-hole at Schladebach, near Ketschau, Germany, of which frequent mention has already been made, and which is now probably the deepest in the world, Mr. Charles Zundel presented some interesting notes in a paper recently read before the Société Industrielle de Mulhouse. The data were obtained directly from Mr. M. Hasslacher, who is in charge of the work, and are, therefore, authoritative.

The hole is 1,748.4 meters, or about 5,735 ft. deep. Boring was commenced in August, 1880, under the direction of the Royal Mines Commission of Prussia in the interests of geological research. Work was continued for 1,247 days, not counting holidays and two long interruptions in 1882 and 1883, and was completed in the autumn of 1886. The average daily rate of boring was, therefore, about 4.59 ft. The total cost of the work was $53,076, representing about $9.25 per foot. The initial diameter of the hole is 280 m. m. (about 11.2 in.), and the drilling apparatus used was of the well-known drop tool form, a casing being carried down as the drilling progressed. At a depth of about 187 ft. this casing would go no further and drilling was, therefore, continued without it. The loose texture of the material passed through, however, showed that a casing was absolutely necessary and a smaller tube, 230 m. m. (9.2 in.) in diameter, was consequently let down.

After a depth of 574 ft. had been reached, boring was continued by means of a diamond drill, 210 m. m. (8.4 in.) in diameter, yielding a core 140 m. m. (5½ in.) in diameter. The size of the hole was decreased at intervals, as the depth increased. At 3,510 ft. it measured only 48 m. m. (1.62 in.) in diameter, and at 5,655 ft. it had decreased to 33 mm. (1.32 in.). It is not to be supposed that the boring had been carried along so far without accidents and consequent delays. As a matter of fact, there had been very many of them which might well have discouraged further progress. Still, the work was continued with much patience. When the depth of 5,735 ft., however, had been attained, there was a succession of discouraging mishaps, and it became evident that further progress could be made only very slowly and at heavy expense. Operations were, therefore, discontinued.

Thermometric measurements in the hole were commenced in 1884 after a depth of 3,936 ft. had been marked, and were repeated at every 30 meters (98½ ft.) further down. These observations were made with much care, and naturally took up considerable time. The thermometers were fixed in a water chamber and this, in turn, was enclosed in a wrought iron casing to prevent breakage of the instruments under the enormous pressure at those depths, due to the water used in clearing out the bore-hole. Three thermometers were used for each reading, the mean of their indications being taken. The thermometers, for each observation, were left in the hole for from 15 to 16 hours. The observations showed that there was a regular, constant increase in temperature with increase in depth. At 5,628 ft. the temperature was 45.3° R. (133.8° Fahr.), and there was an increase of 1° R. for every 46.09 meters (about 151 ft.). From the data thus obtained Mr. Zundel deduced the following formula for calculating the temperature, in degrees Réaumur, at any given depth:

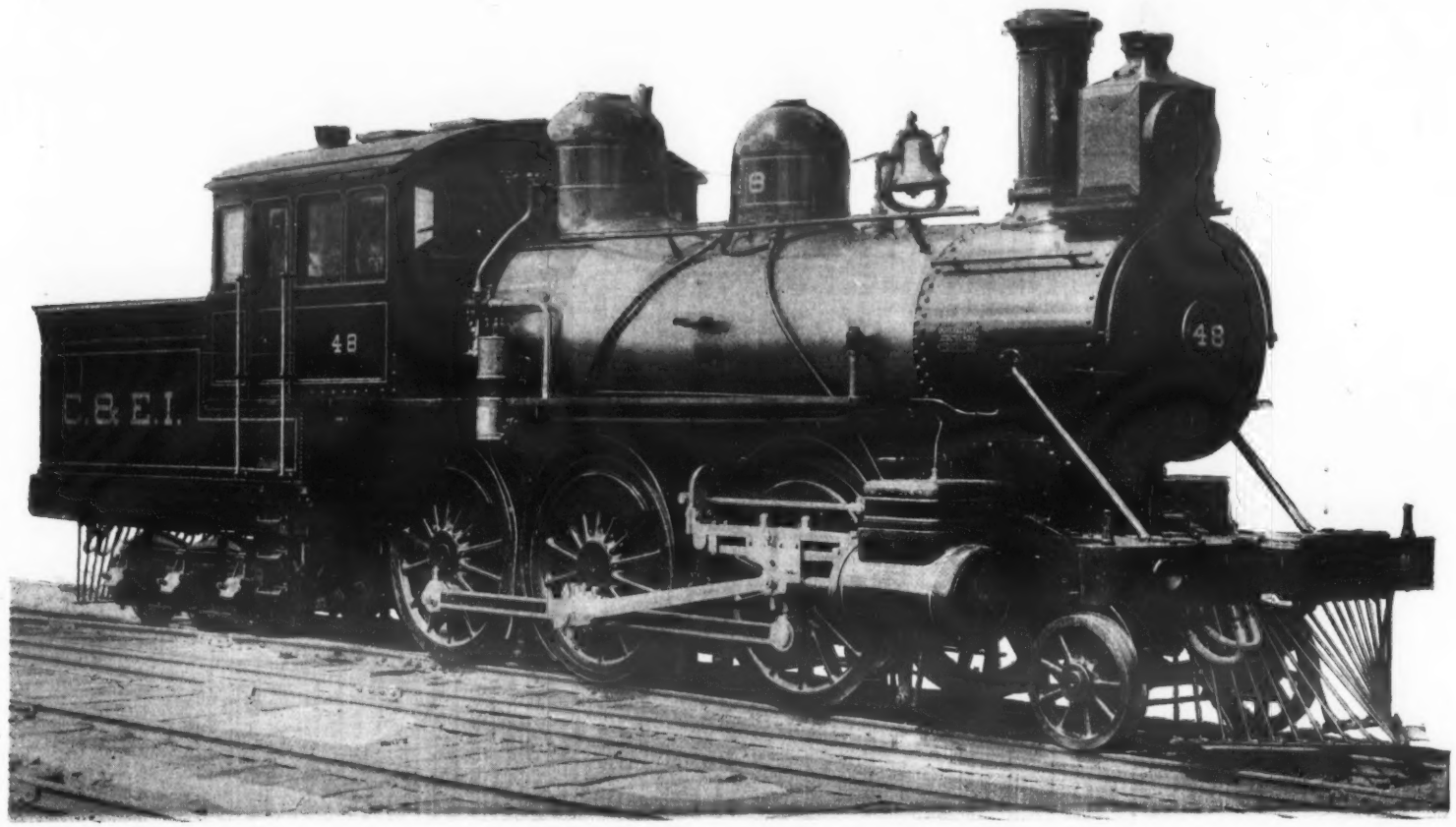
$$R. = 8.3 + \frac{P - 6}{46.09},$$

in which P represents the depths in meters.

Electric Lighting of Trains.

The experiments of the German and Swiss railroads in electric lighting of trains are chiefly with the secondary battery system of the Oerlikon Machine Works. These experiments are attracting considerable attention.

The Oerlikon secondary battery, well known to electricians, contains in place of the usual dilute sulphuric acid, a thick electrolyte consisting of gelatinous silicic acid soaked with dilute sulphuric acid. Such an electrolyte, as may be easily imagined, is of particular advantage in electric train lighting, where the batteries are continually jarred by the motion of the train. A single cell out of order in a battery has been found sufficient to put out the lights in the car supplied by it.



SUBURBAN LOCOMOTIVE FOR THE CHICAGO & EASTERN ILLINOIS.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

To keep such cells in working condition requires much attention, which is partly avoided by the use of a gelatinous electrolyte.

The cells used for such service contain plates 5.9 ins. square and about 0.1 in. thick, placed 0.14 in. apart. A cell containing 29 such plates has a capacity of 160 ampère-hours, the plates weigh 33 lbs. and the cell complete weighs 44.1 lbs. The current during charging should not exceed 15 ampères, nor 20 ampères during discharging. These cells are packed in pairs in wooden boxes provided with handles for easy transportation. These boxes when filled with the cells weigh 97 lbs. and are 14.6 ins. by 10.6 ins. by 11 ins. in size. Each box has a binding post for the negative pole and a short conducting wire which serves as a positive connection. Four such boxes are placed in each car, or rather under it, their total weight with supports and connections being about 530 lbs.

The battery is designed for a maximum duty of 140 ampère hours, which corresponds to the use of 7 ampères for 20 hours; the total capacity, however, is sufficient for a 23 hour run. At the close of this time, the voltage has fallen to 14.8 volts, the lowest permissible amount for the discharge. It materially contributes, however, to the life of the battery if the total charge is not drawn out and 140 ampère hours is accordingly selected as the working limit. The batteries are charged at an electromotive force of 2.5 volts per cell, or 20 volts for the whole battery. A lamp of 16 candle power is used in each compartment of the car.

A number of roads have begun investigating this system of lighting, among which are the Berlin and Strassburg divisions of the German railroads, the Northeastern Railroad of Switzerland and the Central Railroad of the same country. On one division of the last road, a duty of 14 hours is required. Each wagon uses a 9 ampère current, and the batteries are accordingly called upon to furnish 126 ampère hours. Batteries giving 120 ampère hours were first used but proved inadequate to the demands; and those above described were accordingly adopted and have since proved satisfactory. For lighting baggage cars batteries of 90 ampère hours capacity are used.

TECHNICAL.

Manufacturing and Business.

The Globe Stock Car Co., of Chicago, has been organized by Arthur W. Street, John F. Pershing and John W. Waughon.

The Otis Steel Co., Limited, of Cleveland, O., has removed its New York office from the Union Trust Building to the Mills Building, 15 Broad street.

The Haskin Wood Vulcanizing Co. has been chartered at Alexandria, Va., with T. L. Holbrook, President; Levi Woodbury, Vice-President, and E. L. White, Secretary, all of Washington.

The Western Construction Company was incorporated in Baltimore this week by Alfred E. Hatch, Joseph H. Lawrence, Robert S. Vivian, David J. Reinhart and Charles G. Campbell. The purpose of the company is to construct railroads, water-works, tunnels and bridges.

The Northwestern Equipment Co., manufacturers of the "Kewanee" rectangular brakebeam has just completed its plant at Chicago where it will have a manufacturing capacity of 600 beams a day. The Kewanee brakebeam has been specified on 8,000 cars since January 1, 1892.

The Q. & C. Co. announces that the pamphlet on "Economics in Maintenance of Way," by Benjamin Reece, has been in such demand by railroad officers for distribution among their trackmen that the company has ordered a large second edition and will send copies on application to any officers desiring them. Address the Q. & C. Co., 703 Phenix Building, Chicago.

New Stations and Shops.

The New York, Ontario & Western will build a new wooden station at Liberty, N. Y., the cost of which will be about $25,000. Other new stations will be built at South Unadilla and Sylvan Beach, N. Y.

The Lake Shore & Michigan Southern has decided to build a handsome new union passenger station at Sandusky, O. The building will be four stories high and the material used will be pressed brick. It is expected that the structure will cost $100,000 when finished.

President Van Horne, of the Canadian Pacific, when in Winnipeg, Man., last week, said that the company intended to build a handsome station in that city soon, but he declined to state anything about the location of the building or when it would be built.

The Heilmann Electric Railroad System.

The Heilmann electric railroad system, brought out a short time ago abroad, has recently undergone an important modification well worth noticing. Mr. Heilmann's original plan was to fit up every car of his train with an electric motor, taking current from a dynamo in the first car of the train, and thus utilizing the weight of the whole train for adhesion. This arrangement natuoally precluded the possibility of easily utilizing the ordinary railroad cars. The necessary changes would have been expensive and troublesome. Mr. Heilmann accordingly has come to the plan of using a regular electric locomotive of suitable adhesive weight for the train. This locomotive will be fitted up with a steam engine and boiler, and dynamo furnishing current to the electric motors with which each of the eight axles will be supplied. The train itself will be made up in the usual manner, of ordinary cars, in which no changes need be made. A locomotive of this type is now being built for experimental use on the French Government roads, and is designed to develop 480 H. P. The boiler is of the Lentz pattern, which has already been adopted to some extent on the French lines, and the engine will be a horizontal compound one, rated at 600 H. P., working with 180 lbs. steam measure and at a speed of 300 turns per minute.

Car Heating.

The National Car Heating Co., of Topeka, Kan., and Chicago, issues a circular from Mrs. Julia E. Searle, dated May 21, 1892. Mrs. Searle addresses the manufacturers and users of car heating apparatus, and announces that she has granted to the National Car Heating Co. the exclusive license under the patent of John Q. C. Searle, dated May 10, 1892, No. 474,417. One object of this invention is to provide an apparatus with circulation pipes on both sides of the car, two cross-over pipes, two drums communicating with the circulation pipes and train pipe for supplying steam to heat the circulating liquid and an expansion drum.

A Substitute for India Rubber and Gutta Percha.

A new preparation for the purpose of replacing India rubber and gutta percha has been proposed and patented in Europe. A quantity of Manila gum, tempered with benzine, to which is added five per cent. of Auvergne bitumen, also mixed with benzine, is thoroughly mixed. After 48 to 86 hours five per cent. of resin oil is added. The product obtained from this mixture has all the valuable properties of India rubber, including that of vulcanization. Should the product be too fluid, four per cent. of sulphur dissolved in bisulphide of carbon may be added. By adding a small amount of India rubber the mixture is a more suitable compound for certain special purposes.

The Chignecto Railway.

A cable dispatch from London states that a partial resumption of work on this road has been ordered. The work has now been suspended for about six months.

Solidified Petroleum.

The Cleuhall process of solidifying petroleum seems to have overcome many difficulties which have previously interfered with the successful production of a fuel of this kind, judging by recent public tests at the works of the Solidified Petroleum Corporation, England. The cakes remain entirely unaltered by exposure to air, evincing no tendency to reliquefying, even during the process of combustion. They ignite simply by contact with a lighted candle, and the caloric properties are largely in excess of those of an equal weight of coal. A 6-H. P. tubular boiler containing 80 gallons of water was heated by 62 lbs. of the Cleuhall fuel, and in 36¼ minutes the steam gauge indicated a pressure of 60 lbs. Afterward, the temperature of the water being 83° F., 90 lbs. of coal, ignited by 14 lbs. of wood and 2 lbs. of shavings, required one hour to produce a steam pressure of 60 lbs. The results of the tests lead to the following comparative values: 1 lb. of solidified petroleum evaporated 13 to 14 lbs. of water, and the consumption per indicated horse power per hour was 1.60 lbs., whereas 1 lb. of the best steam coal evaporated 6.1 lbs. to 7 lbs. of water, the consumption per indicated horse power per hour being 3.10 lbs. It is proposed to erect works for the manufacture of this fuel in the various oil regions of the world, and ship it in its solidified form, which it is claimed will be cheaper and less dangerous, as the cakes are non-volatile and non-explosive. One of the advantageous features of the fuel, as prepared by Mr. John Snell Cleuhall, is that it burns without smoke. The bricks gradually coke, and finally are consumed, leaving a small residue of white ash.

Hydraulic Cement on the Canadian Pacific.

The press dispatches which have said that the Canadian Pacific is about to erect hydraulic cement works at Vancouver, for the purpose of rebuilding all of its docks in béton, appears to be premature at least. The facts are that the company has had a man examining the ground near its line in British Columbia, with a view to establishing cement works to supply its own needs, which will be very large for some years to come. This has not been done with a view to building any large docks or other special works of that character. The cement is required for ordinary railroad works.

The Coupler Gauge.

Mr. A. W. Van Dorston writes that he has received one of the new M. C. B. coupler gauges and tried it on the Van Dorston coupler, made to the improved lines, and that he would ask for nothing better. The committee deserves much credit for the designing of the gauges, and in his judgment the variations are sufficient. The Pratt & Whitney Co. have also done their work well.

Pneumatic Interlocking on the Chicago & Northwestern.

The Union Switch & Signal Co. has contracted to erect a large number of interlocking and block signals on the Chicago & Northwestern at and near Chicago. The Galena Division of this road runs directly west from Chicago and from this the Milwaukee Division branches to the northward a short distance out from the main passenger station at Wells and Kinzie streets. About 3½ miles from Chicago, on the Milwaukee line, is Clybourne Junction, where another line branches to the left or northwest. Pneumatic signals are to be erected in connection with all switches, etc., as far as Deering, just beyond Clybourne Junction, and as far as West Fortieth street, on the Galena Division, which is 4.7 miles from Chicago. There will be interlocking towers at five important points, including two drawbridges and one crossing and at several smaller places, and the intervening road will be equipped with automatic block signals. The total amount of road covered is about 8 miles, and this completes the signaling of the road from the Chicago terminus to the points on the three different lines mentioned, where the Hall automatic signals, referred to in a former issue of this paper, begin. These latter, it will be remembered, extend some 30 miles out on each line.

The Union Switch & Signal Co. is to erect a 32-lever mechanical interlocking machine at the crossing of the Chicago & Alton, the Atchison, Topeka & Santa Fe and the Belt railroads at Lemoyne, near Chicago.

Car Ventilation.

In the *Railroad Gazette*, Nov. 6, 1891, was shown drawings of R. M. Pancoast's improved exhaust and intake for ventilated fruit cars. The improved methods have met with such success in this service that Mr. Pancoast is now applying similar methods to passenger-car ventilation. His passenger-car intake separates cinders and rain from the air, without the use of screens or water, by an arrangement of fixed surfaces, which throw off by impact the heavier particles in the air. The intake is at the floor line, and he has small but powerful exhausts applied on the outside, between each two clear-story windows. The Car Ventilating Company, of Philadelphia, has control of these devices.

Compound Marine Engines in Canada.

The Polson Iron Works Co., Toronto, has just shipped the compound marine engines built at the works for the Dominion cruiser No. 2, now nearly ready for launching at Owen Sound. The cylinders of this engine are 18 and 36 ins. diameter and 24 ins. stroke. A similar engine is being built for cruiser No. 3.

The Projected Northumberland Straits Tunnel.

The contract for the experimental boring for the proposed tunnel under the Northumberland Straits to connect Prince Edward Island with New Brunswick, has been awarded to McRae & Co., of Ottawa, Can. They have shipped a large outfit, consisting of a diamond drill and other apparatus to be used in the work.

THE SCRAP HEAP.

World's Fair Notes.

The World's Fair directors will have much valuable machinery for the nominal sum of $1. Many of the large manufacturers want to be represented at the World's Fair, and for advertising purposes are willing to set up costly machinery, grant its use for nearly two years, and remove it at the end of the exhibit for $1. On the grounds there will be required steam engines of a capacity of 20,000 H. P. The water for fire protection at Jackson Park will be supplied by four Worthington pumps with a total capacity of 40,000,000 galls. per day.

An electric launch 36 ft. long and 7 ft. beam, and with a seating capacity of about 30 passengers, is being tested on the lagoon at Jackson Park with a view to being adopted for transporting passengers on the waterways at the fair grounds. The motive power is a Jenny motor of five horse power, wound for 100 volts, which at its normal speed of 600 revolutions, drives the launch at a speed exceeding nine miles an hour. The current is supplied from 104 cells of a new type secondary battery. The Columbia Launch Co., of Chicago, built the launch.

The Staten Island Rapid Transit Improvements.

The contract has been let to C. McLane, 415 Broadway, New York, to build the docks, bulkheads and ferry bridges at St. George, Staten Island, in connection with the extensive improvements to be made at that place, both for the Baltimore & Ohio and Staten Island Rapid Transit roads. There will be 230,000 sq. ft. of dock work, 1,400 sq. ft. of bulkhead and two ferry bridges, etc. The new ferry terminal will be located 800 ft. south of the present one. Connected with the ferry will be a new station, which will be reached by a covered passageway from the ferry, and by an overhead bridge from Jay street. The station will be 60 × 90 ft., and will be built of iron. On each side of the station will be two covered platforms, each 500 ft. long. On the South shore line will be three covered platforms, each 500 ft. long. The triangular space between the tracks leading along the north and south shores will be filled in with platforms to be used in emergencies. Teams and trucks will also reach the ferry without crossing any tracks. Two tracks each for the Baltimore & Ohio, South Beach and Tottenville lines will be built, and a large storage yard containing 25 tracks will be built on the north side of the ferry terminal.

A wooden freight house 300 × 40 ft. will be erected for the South Shore line. On the north side of the ferry slips a covered pier 445 × 125 ft. will be erected, and on the south side a covered pier 480 × 125 ft. Each will have two tracks inside and two outside for lighterage freight. These piers will be numbered 3 and 4 and will be in a direct line with piers 1 and 2. Between piers 3 and 4 a spacious dock of sufficient dimensions to receive ocean liners will be built, so that freight can be transferred directly to and from the cars. On the north side of piers 1 and 2 now built, two open piers will be constructed for storing freight and loading it on lighters. Between these piers three float bridges will be located for handling carload lots for transfer for New York. A coal pier is already built north of the site for the open piers and a second coal pier is to be built. Work on the improvement will probably be begun at once. Further particulars of the plans were published in the *Railroad Gazette* of May 27.

Commissioner Eddy.

The Commission appointed in New South Wales to inquire into the charges of dishonesty brought against Mr. Eddy, the Chief Commissioner of Railways, has decided that the charges are without foundation.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

A correspondent on the Norfolk & Western writes as follows:

Our rules provide that trains having right of track shall wait at meeting points five minutes for possible variation of watches, and at each succeeding station until expected train is met, if it is of the same class. No. 2 eastbound, being the train of superior right, gets an order to run two hours and thirty minutes late over the entire division. When this train strikes the time of No. 3, which is of the same class, or rather the point where 2 and 3 will meet if No. 2 is two hours and thirty minutes late and 3 on time, is No. 2 required to wait the five minutes additional and run two hours and thirty-five minutes late from that point until No. 3 is met? I claim not, but cannot give a satisfactory reason for the faith that is in me.

Our correspondent evidently does not quote his rule verbatim, and the requirement that superior trains shall wait any specified time is not found in the standard code; but the construction of the first paragraph under Form E. (for a time order) in the standard code* shows that the train should run 2 hours and 35 minutes late from the point named, for the order acts as a temporary change in the schedule of train 2, and when that train is running on its schedule it has to lose the five minutes. The opposite view is doubtless based on the idea that the two hours 30 minutes *includes* the 5 minutes. But the conductor of train 3 cannot accept this view, because he has authority to treat the new time precisely as he treated the old (or time-table) time. And if *he* cannot accept it the conductor of No. 2 must not.

The term "classification signal" is used several times in the standard code of train rules to designate any or all of the flags and lanterns ordinarily carried on the front of an engine. This use of the word "classification" is obviously inexact, and it has finally been questioned, as it was sure to be some time. Trainmen on the New York Central & Hudson River have discussed it so much that one of the conductors, "H. N. R.," has written a dissertation on the subject in the monthly magazine, *New York Railroad Men*. He shows that a white flag is a classification signal, because it indicates the class of the train carrying it, but that a green signal cannot *classify* either the train that carries it, or the one which follows, because they are already classified by the time table. Another conductor wrote an argument to combat this view, and a decision of the dispute, by General Superintendent Voorhees, is also printed. These magazine articles are hardly worth while. The men who wrote them apparently think that any use of terms countenanced by the standard code is necessarily infallible, but it is not, and the way to treat an obvious error like this is to either put up with it, thinking one word and speaking another, as has been done with train rules from time immemorial, or substitute for the wrong word one that is right, whether the standard code likes it or not. The first method is the only one open to employés unless they can get the superintendent to adopt the other one. This error, which is found in rule 72 and in the diagrams numbered 6, 8 and 11, doubtless failed of elimination merely from oversight, and is an illustration of the fact that mistakes are made by the best of book makers.

* "Example 1 makes the schedule time of the train named, between the points mentioned, as much later as the time stated in the order; and any other train receiving the order is required to run with respect to this later time, the same as before required to run with respect to the regular schedule time."

Among the statements made in the discussion above referred to is this: "The gravel or work train following the Empire State Express which displays green signals for it, is for the time being of the same class as the fastest and most popular train in this country"—and a correspondent calls our attention to it with a sarcastic allusion to the fact that an inspection locomotive carrying a road master and a bridge engineer became involved in a collision the other day, injuring the officers mentioned, when it was running as a section of a fast limited express. A yard engine ventured on the main track after the first section had passed, the runner evidently having failed to look for signals on the express engine. The inference which our correspondent evidently intends to have drawn is that the boasted safety of the New York Central "limited" trains is not so great as it is made to appear; that so far as the rules and the practice go, the second sections of the fast and heavy express trains are no safer than many trains less bragged about, whatever may be said about the first sections. We do not know whether or not the New York Central requires an engineman carrying green signals to sound a whistle signal whenever he passes a yard engine, and therefore cannot tell the exact nature of the blunder that caused this collision, but it is well known that this whistle signal is used and liked on many roads. Some conductors and enginemen have been known to take advantage of the rule requiring it to neglect the duty of looking for the flags, but strict discipline ought to overcome that. But whether there is an audible signal or not the best way to make men look for the visual signal is to require them to make a record of what they see on every engine of a superior train. This implies that there should be *some* signal on the engine of every train, for the duty of recording "no signal" is one which seems peculiarly adapted to induce men to tell a lie, to say they *saw* that there was "no signal," when in fact they did not look at all. As the New York Central is understood to be rapidly equipping its road with block signals this discussion comes near being a "back number," so we will stop it; though in the interim between now and the time the block system goes into effect we would suggest that empty engines be made the first instead of the last section when run on the schedules of regular trains. It is a fact of real life, though not recognized by the theories in "the books," that the vigilance of freight and yard men in clearing the road for superior trains varies somewhat in proportion to the spectacular grandeur of the latter. New and gorgeous palace cars, drawn by the best engines on the road, do inspire a respect that cannot be wholly enforced by plain rules. The sentimental meaning conveyed by the words "No. 20" adds strength to the cold rule ordering the track to be cleared for it. It is sad, but it is so.

The Massachusetts Railroad Commissioners give notice that the biennial examination and test of safety freight car couplers, which the law requires the Board to make, periodically, will be made on June 22 and 23. Applications for examination must be filed with the Board at 20 Beacon street, Boston, before June 15. No coupler will be examined unless it has been in actual use and is presented for test fitted to cars; models will not be examined. This law, it will be remembered, was passed six years ago, and under it the Commission approved of the Janney, the Ames, and various other automatic couplers, thus encouraging diversity and doing more harm than good, probably. What good an examination will now do, it is hard to see. Uniformity is essential if safety is to be enhanced, and this resolves the Commissioners' duty into the simple process of approving every coupler which conforms to the M. C. B. lines and rejecting every other. Technically there might be a question of approving a link and pin coupler, if one claiming to be automatic should appear at the trial, but practically the Board cannot ignore the rapid introduction of the M. C. B. type and the official approval of it by the American Railway Association. Details of construction, character of material and uniformity of unlocking devices might, indeed, be considered by the Commissioners if they were a body of mechanical experts, as there is unending diversity in these respects among couplers that are uniform in their main feature; but it hardly seems reasonable to suppose that the law contemplated any such close and fatherly supervision of details of railroad operation as that would be, and the Commissioners are more likely to restrict than to magnify their powers.

Power Required to Haul Suburban Passenger Trains.

The inadequacy of all electric locomotives proposed for heavy and frequent passenger trains—for service such as must be handled on the prominent suburban railroads—has several times been referred to in these columns, and in particular on Nov. 6 last. We have pointed out what seems to be a lack of appreciation on the part of the electric companies and designers of the problem to be solved. We now present some definite information on this subject to show clearly what is needed in an electric motor if it is to do the work now performed by steam locomotives in the service referred to. The data is based on the present operation of the suburban section of the Illinois Central road in Chicago, one of the largest suburban traffic fields in this country.

The large diagram, fig. 1, gives the number of trains on the line at the most crowded period in the evening—viz., between 5 and 6.20 p. m.—the location of the trains at a given time, and the conditions under which the locomotives would work if the trains were running exactly to the time tables. The diagonal numbers at the top and bottom correspond to the stations on the road. The distances (horizontal) are given in miles. The vertical divisions represent minutes of time. The short breaks in the lines represent the lengths of the stops, which average about 15 seconds when the trains are not too crowded and the trainmen are alert. The trains are composed of from four to 16 cars, according to the traffic, and the average number of cars per train during the hours represented by the diagram is six. The diagrams, figs. 2 to 7, show the velocities of a train between stations on a distance and a time basis: that is to say, figs. 2 to 4 show the velocities at the different seconds of time from the instant of starting, and figs. 5 to 7 give the velocities at different distances from the starting point.

The horizontal divisions represent feet or seconds of time as the case may be. The vertical divisions represent seconds of time, pull on drawbar in pounds per ton and total horse power required to haul the trains at various speeds. These diagrams show also the time from starting from a station to the brake application, and the horse power at different points between stations. From these several diagrams we can obtain the total horse power exerted by the locomotives in hauling the trains, locomotives included, on the line at any instant; also the total pull on the front drawbars, taken to include not only the frictional resistance of the train, but that necessary to overcome the inertia of the train.

This data is based on actual speed and indicator diagrams taken from the suburban engines on the road, and is as accurate as necessary to give a perfectly safe basis for estimating the power needed to run the road by electricity. From these diagrams we have calculated the average and maximum horse power between stations required to pull a train, and the average and maximum horse power required to run all the trains. The results are given in what follows, together with the amount of coal consumed per useful horse power absorbed in hauling the cars and their lading per hour.

Average number of cars per train	6
Maximum number of trains on line at any one time	14
Maximum number of cars on line at any one time	84
Average horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	390
Maximum horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	510
Average pull on the forward drawbar of the train in pounds, taken as an average of the pull between stations	7,750
Maximum pull on drawbar at starting, pounds	14,000

If all the trains are running exactly according to the large diagram, which accords with the time table, then the following averages and maximums may be deduced:

Average aggregate horse power for all trains on the line	2,600
Maximum horse power for all trains	4,500
Aggregate pull on forward drawbars, average, pounds	51,700
Aggregate pull on all forward drawbars, maximum, pounds	108,750

If it happens that all trains are running at once, but not necessarily all starting at once, then the following is obtained:

Average horse power for all trains	6,270
Maximum horse power for all trains	7,110
Average pull for all forward drawbars, pounds	172,200
Maximum pull for all forward drawbars, pounds	196,000

According to the diagram, fig. 1, the following are the averages between the hours of 5 and 6:20 p. m.:

Average number of trains on line	12.3
Average number of trains accelerating at one time	6.6
Maximum number of trains accelerating at one time	10.
Average number of horse power hours of work done by each steam locomotive per day	2,145
Average amount of coal used by a steam locomotive in doing 2,145 horse power hours of work, pounds	14,000
Average amount of Illinois coal used per horse power hour, pounds	6.52

These diagrams and tables give exactly what an electric locomotive will have to do in order to duplicate the work now done by steam locomotives. This is

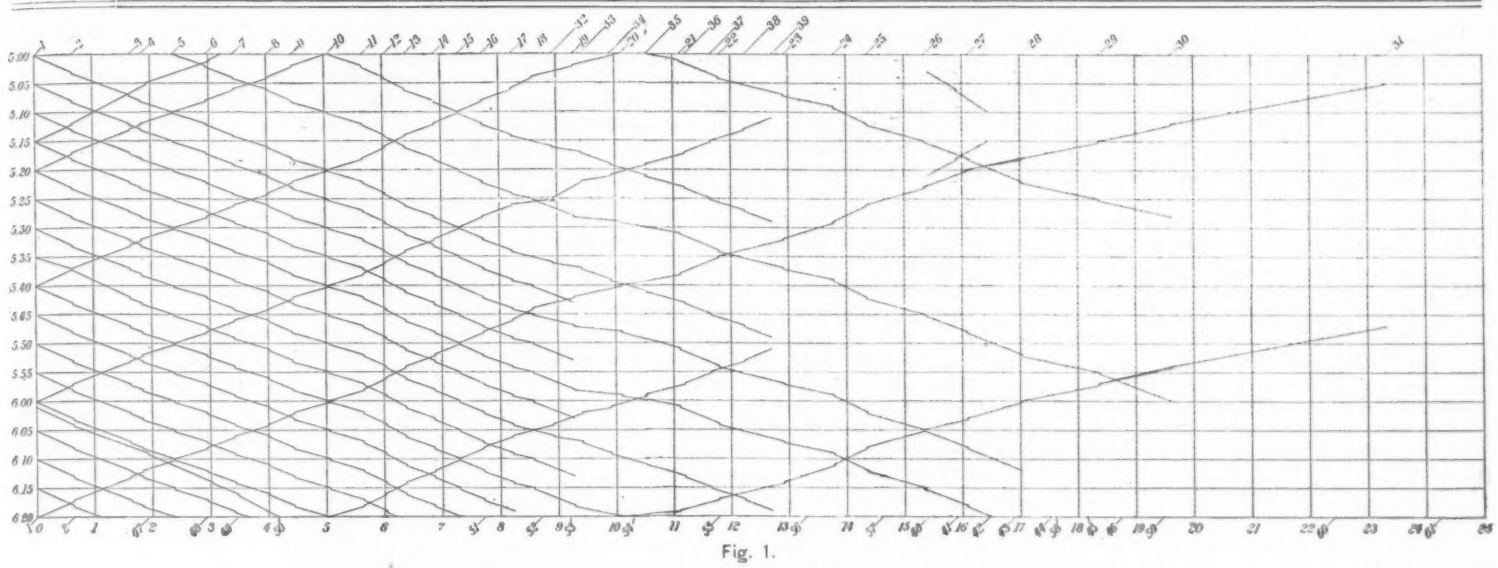

Fig. 1.

TRAIN SHEET OF SUBURBAN TRAINS—ILLINOIS CENTRAL RAILROAD.

outside of all problems of switching, signaling and distribution of power. Of course, all those matters are readily settled. Where a railroad company owns its right of way, it is comparatively a simple matter to lay conductors for the electric current, and the switching of the current can be readily done. The whole question about the substitution of electricity for steam is centred around the possibility of getting a motor sufficiently powerful to do the work, and the handling of such powerful currents as would be necessary on a line like the Illinois Central, where a total of 7,000 or 8,000 H. P. is needed. The business of the Illinois Central is constantly growing. The number of trains will be doubled within the next few years, and the suburban business will be extended further from the terminus. But, of course, more than one electric station could be used to supply the line, and distribution, in itself, is probably not an insurmountable obstacle. The problem that remains to be settled before much enthusiasm can be aroused among steam railroad men is that relating to the possibility of making an electric motor with power equal to that of the steam locomotive. It will be noticed that the average horse power between stations is about 390, while the maximum is 510.

The problem, then, is to construct and maintain an electric locomotive of sufficient weight to haul a train, one capable of evolving from 500 to 800 H. P. More than one motor to a train is practically out of the question. The exigencies of excursion days, when heavier and more numerous trains are run, we will ignore for the present. It now remains for those engineers who make electricity a special study to bring forward their plans and show what they propose to do. As yet they have shown no evidence of ability to meet the serious problem we have here outlined. Many railroad men have a feeling of confidence that electric motors will some day supplant our steam locomotives, but it is in most cases decidedly indefinite, not to say superficial. This sentiment encourages the electrical inventors, and it is right that it should, but they will need something more tangible if they are to make the desired progress.

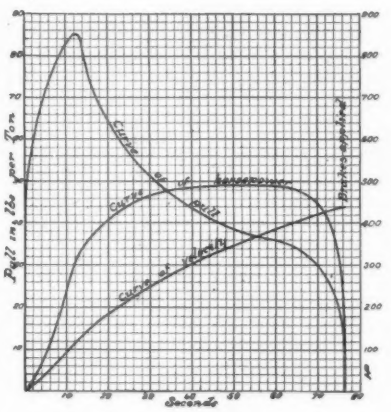

Fig. 2.

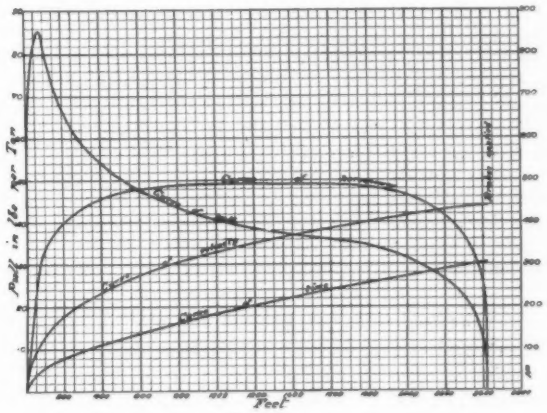

Fig. 5.

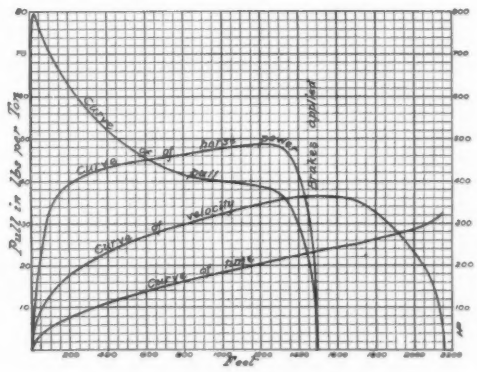

Fig. 6.

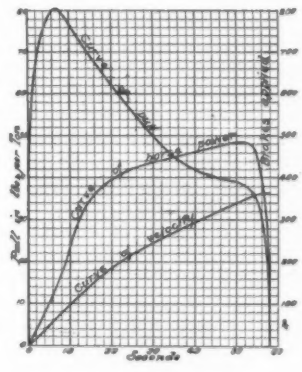

Fig. 3.

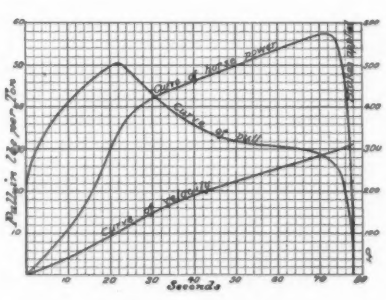

Fig. 4.

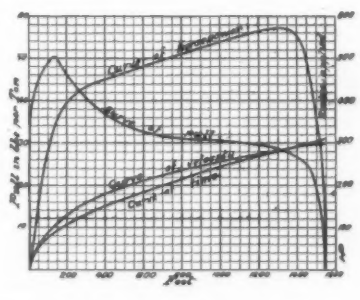

Fig. 7.

POWER REQUIRED TO HAUL SUBURBAN PASSENGER TRAINS.

Diagrams of Speeds and Resistances.

The Master Mechanics' Association and the Vertical Plane Coupler.

Last year the chairman of the Master Mechanics' committee on the status of the car coupler question said: "I must say for the committee that they have been unable to see their way clear to make a report that would be of any consequence to the association, and their unwillingness to make a report that would not stand the test of time is my excuse for not making a report on the coupler." Following this verbal report it was voted that it was the sense of the Convention that the use of the vertical plane coupler was a move in the direction of progress, and the committee was continued, with power to represent the Association before the combined boards of state railroad commissioners.

It would seem that this year the committee might do more than this, as the coupler has been long enough in use to determine its security as a coupling device; its application to varying conditions of track and rolling stock; its durability in service; its value as a safeguard to train men, and its effect in reducing the free slack in trains of air-braked cars. Many of the members of the Master Mechanics' Association are also members of the Master Car Builders' Association; those who lack precise information about these details of durability and action can easily get it. For the Master Mechanics' Association to longer withhold its full and complete approval of the vertical plane coupler is to throw discredit upon the Association or to reflect upon the activity of its members. If in the minds of the members of the committee there is a defect in the coupler *per se*, which prevents their approval, then, in justice to all, their views should be made public. On the other hand, if there is nothing that is decidedly against it as a coupling device, it ought to be approved. What is needed now to enable railroads to get a proper return for the large amounts of money already invested in new couplers is concerted action on the part of all concerned and a general endeavor to make couplers in the best way and of the best material, all of which will encourage the adoption of the new standard by railroads generally.

Before railroad companies generally will feel themselves warranted in ordering large numbers of a new coupler for their cars they must know that there is some control over its design and manufacture tha t will assure them of getting a substantial and serviceable product. To-day there are vertical plane couplers for sale that are wholly unfit for use. On the other hand, there are other vertical plane couplers that are probably as strong and as perfect as couplers will be made or need to be made for many years to come. The

bad couplers throw discredit on the good with the result that railroad officers feel uncertain about them, and therefore hesitate and withhold orders that would be made if they could have confidence in what they were buying. The steps taken by the committee appointed last year by the Master Car Builders' Association, in proposing a set of standard tests and a scheme for inspection, indicate what is needed to give increased confidence. There should be in every purchasing department a specification on which it would be perfectly safe to buy any number of vertical plane couplers. With such a specification, approved by the Master Car Builders' Association, any railroad officer could know whether any given coupler offered to him would prove a safe investment.

Still more valuable, perhaps, as a means of assisting railroads to distinguish between good and bad is the proposition of the committee to have a series of tests made under the auspices of the Master Car Builders' Association of all couplers offered for sale. This was done for train brakes, and probably once for all time, as the outcome was a great amount of accurate knowledge about brakes which will enable any railroad company to distinguish between a good and a bad brake. It is to be hoped, however, that the results of the tests of car couplers, if made, will not be like the result of the first tests of air brakes in 1886, which was to throw out all the brakes in the market. It is a pertinent fact that the committee did not reduce the requirements to meet the brakes then in use—they stuck to the requirements, called for better brakes, and got them. In prescribing tests for vertical plane couplers, perhaps there should be some preliminary investigation to find what is necessary to make a safe coupler. The committee could then formulate the requirements on the results of the investigation, and proceed with the tests, adhering rigidly to what is necessary, but not lowering the requirements to meet the devices in use.

The Louisville, New Orleans & Texas.

The Illinois Central directors ask their stockholders to authorize them to purchase the securities of the Louisville, New Orleans & Texas Railway on terms which have been agreed upon between the two directories, and they are to vote on the question June 18. The Louisville, New Orleans & Texas should be called the Memphis & New Orleans, these cities being the termini of its main line, which is 456 miles long. It has besides a loop line 151 miles long, closely following the Mississippi, and branches which bring up the total mileage to 798 miles. By far the larger part of its mileage is in the Mississippi bottoms, but from Vicksburg to Baton Rouge it passes through a hilly country less fertile than the bottoms, but not so heavily wooded, much more easily cleared and healthier. Perhaps half its mileage is in the Yazoo Delta, so called, a broad expanse of bottom land between the Yazoo and the Mississippi, densely wooded with a growth of enormous trees, cut up by bayous, naturally liable to overflow, and with a soil as fertile perhaps as any in the world, but unhealthy to such an extent that though its quality has been well known for a century, and it had settlements 70 years ago, and the navigable streams and bayous have always afforded a reasonably cheap outlet to markets, it still has but a small fraction of its surface cultivated. There have been, however, other obstacles to its development. A very large part of it required costly defenses against floods, and the growth of timber is so dense and so heavy that clearing is a very costly operation.

The main line and the Yazoo Valley branches were built by Mr. C. P. Huntington as the southern end of the system which was to connect the Southern Pacific system with the Atlantic. But the Pacific business in the nature of things could afford it but an insignificant traffic, and even the other traffic between New Orleans and the Atlantic is too small to do much to support such a road, which must depend chiefly on the country directly on its line, and for through traffic on the business between New Orleans and the Upper Mississippi Valley, St. Louis, Kansas City, Chicago, Louisville, etc. For the through business and for a considerable part of the local it has to compete with the river steamboats, which greatly limits rates, but does not prevent a pretty large through movement at rates which doubtless more than pay the expenses caused by it.

The Illinois Central's southern lines adjoin those of the Louisville, New Orleans & Texas, and are able to afford it a northern connection, which ought to be of decided advantage to it. There is, probably, no other company which could make so good use of it, except possibly the Louisville & Nashville.

The Louisville, New Orleans & Texas has been fairly prosperous. With light fixed charges (about $800 per mile), it has had a considerable surplus; but its capital is largely represented by income bonds, on which interest is due only when earned. The Illinois Central is offered a great majority of the securities of the company (doubtless still in the hands of the capitalists who built the road) on terms which would make the cost of the whole $5,000,000 in cash, and $20,000,000 of its own 4 per cent. bonds, secured by pledge of the purchased securities. Counting the cash (which it has now available in its treasury) the same as the bonds, this will make the yearly cost of the property to the Illinois Central $1,000,000, which is a trifle more than the average net earnings for the last three years reported.

There can be no doubt that the country on this road will some time enormously increase its production, but it does not grow like a new prairie country. In the Yazoo Delta the farmers are largely negroes, some of whom buy a few acres and attempt to clear their land, while more probably rent (at very high rents) land already cleared. To bring the land under cultivation rapidly a very large expenditure of capital is necessary, which probably would be forthcoming easily enough if the capitalists felt sure of getting their returns without having to live in the country. The upland country south of Vicksburg is perhaps developing faster than the Yazoo Delta; but when both are brought thoroughly under cultivation, the latter will be very much the most productive. Altogether, the purchase is one which is likely to be advantageous to both buyer and seller, and to the communities which both companies serve.

The Rapid Transit Situation in New York.

An excellent letter on rapid transit in New York appears in the New York *Evening Post* of June 1 from Mr. J. J. R. Croes. The letter appears to have been written to give the *coup de grace* to the work of the Rapid Transit Commission; but was hardly necessary, for no one thinks now that the plans of the Commission can be carried out. Nevertheless the letter was worth writing and is worth reading. Carlyle tells somewhere of a German doctor of something who had his opinion of St. Paul. "Paulus," said he. "Yes; Paulus was a very good man. I have read his buch, and I do not agree with Paulus." So of Mr. Croes and parts of his letter; we do not agree with all of it, but it is very good in the main.

He quotes from Mr. T. C. Clarke's recent articles to the effect that the fundamental principle of a perfect system of rapid transit is that the lines should "follow those streets which are the busiest thoroughfares;" and also the words of the Rapid Transit Commissioners that the "first lines of railroad to be constructed should be on or near the important thoroughfares, coincident with the main arteries of travel." "This statement of principle," says Mr. Croes, "has an alluring sound." He then proceeds to take the stuffing out of the principle. He holds that a great thoroughfare like Broadway is essentially a series of "loitering places, rather than a route for speedy traffic continuously for long distances;" that people go in throngs to particular parts of the street for particular purposes; that it is not the purpose of "rapid transit" to intensify the crowds in those parts by bringing to them further crowds, whose only object is to get away; that the object of rapid transit is to divert and dissipate such crowds.

This too "has an alluring sound," but it still holds true that the rapid transit lines should stick close to the established lines of great movement *if they are to pay*, and we believe that Mr. Croes is that kind of a business man and social philosopher that he thinks they should be built to pay. We doubt if he wants the man who lives and owns real estate in New Jersey or Brooklyn taxed to pay for the rides, and boom the real estate of the man who lives in Yonkers. But a rapid transit system that costs so much as it must cost in New York will have to be so placed as to pick up a large short distance travel if it is to pay, and it cannot go far from Broadway and do that now. Probably a really *rapid* transit system would pay some time wherever it is placed in New York City; but we assume that the problem is to locate it so that it will pay soon. It must, then, be on Broadway or between Broadway and the existing elevated roads.

The lesson of the London underground railroads, the District and the Metropolitan, has been pointed out often in the discussions of the last few months. These are rapid transit roads, having good suburban connections and running around the chief business part of the greatest city in the world, and, nevertheless, they do not pay. They have to compete with the omnibuses for the short trip travel at very low rates, and the omnibuses can pick people up and set them down close te their places of departure and destination. In New York the new rapid transit system will have to compete for short and long trips with the very efficient elevated service, for short trips only with various convenient and quick lines of horse cars, and for short and moderately long trips with what we may suppose will be the convenient and quick cable line on Broadway. If it is going to compete successfully it must go pretty close to the places where the great mass of the people want to be taken up and dropped. A good many of our readers will remember the development of this phase of the subject by Mr. Theodore Cooper, in a paper which we published in March, 1891, and we reprint his analysis of the effect of the distance element.

Moreover, much of this traffic [the short trip] is so located that it would not be diverted to any system of rapid transit. Assume as a basis of comparison that the walking speed of a pedestrian is three miles per hour; the average speed of horse cars, six miles per hour; the average speed of elevated railroads, 12 miles per hour; the average speed of express service, 24 miles per hour. To cover certain distances by these different methods would require the times given in the following table:

Distance.	On foot.	By horse car.	By elevated.	By express.
½ mile.	10 min.	5	2½	1¼
1 "	20 "	10	5	2½
1½ "	30 "	15	7½	3¾
2 "	40 "	20	10	5
2½ "	50 "	25	12½	6¼
3 "	60 "	30	15	7½
3½ "	70 "	35	17½	8¾
4 "	80 "	40	20	10

According to our assumed pedestrian speed, the distance covered in one minute's time would be 260 ft., or one short block. Now, on the assumption that the conveyance was ready to start upon the arrival of the passenger, a person would gain nothing in time by taking a horse car for a distance of half a mile, if he had to walk an additional five short blocks out of his way to get the car. Nor could he save any time by giving preference to the elevated railroad over the horse car if he must walk five blocks additional for a travel of one mile. Nor could he go out of his way five blocks and save any time by giving preference to the express route over the elevated for a distance of two miles.

No one line can then expect to draw the traffic from other routes beyond certain narrow limits. The smallness of the traffic upon the Second Avenue Elevated, compared to the great volume of the Third avenue line, shows the difficulty of drawing the traffic any distance, even with the better facilities that could be obtained by a maximum walk of two long blocks.

The Commission certainly had a powerful inducement to lay out the route they did; but it does not follow that the route must be actually in Broadway. The reasons given by Mr. Croes why it should not be are also very strong. He says, "it is, moreover, most injudicious from every point of view to occupy the most expensive portion of the territory across the whole width of the island by a structure which will remove from the possibility of occupancy for business purposes a considerable percentage of the most valuable property, and will tend to depreciate the value of all the property for the purposes for which it is best adapted." He points out the injurious effects of the vibration from trains in a shallow tunnel, the injury to the shopping districts and Union Square from the congestion; the discomfort and injury to health of the small cars and ill-ventilated tunnel and concludes with the following further criticisms of the Commissioners' plans:

It has been shown by the testimony before the Supreme Court Commission that the Commissioners have no knowledge of the height at which the ground water stands under Broadway. They had borings taken at all the street crossings showing the character of the material down to the rock, but very strangely no record was taken of the depth at which water was encountered, nor has any account been taken of the existence of sewers along the entire length of Broadway—not main trunk sewers, to be sure, but still sewers necessary for the carrying away of the house wastes along the entire route. The majority of these sewers are known to be at a greater depth than the roof of the tunnel, so that it would be absolutely essential to open the surface of the street and to relay the sewers in some new position and relay the house connections, or else go down with the tunnel so deep below the surface of the street that for the greater portion of the way it would go through wet ground, and for the entire distance it would be located in direct contradiction to the only controlling principle governing the selection of the route, namely, that there should be no necessity for elevators, and that station platforms should be only one flight of stairs below the street level.

It is not necessary to dwell on the further incongruities and impossibilities of this project, but it may be well to note in passing that the utmost that has been or can be said of the proposed method of propulsion is that the inventors of machines for the utilization of electricity claim that when an opportunity shall have been afforded them to receive proper compensation, they will devise some thing that will do the work. They have not, however, done it yet.

On the whole, although we "do not agree with Paulus" that the new lines should not be built in or close to the most crowded districts, we agree with him in the main inference that the Rapid Transit Commissioners' plan is no solution of the problem, which, we grant, is an exceedingly tough one.

The Floods in Western Pennsylvania.

Our readers will have learned before this, through the daily papers, of the terrible catastrophe in the Oil Creek Valley in Western Pennsylvania, which killed several hundred people last Sunday. The cause of the fire-spreading flood is not very definitely stated in the press dispatches. One or more oil tanks were struck by

lightning, but the most of the oil that the swollen river spread among the houses, factories and bridges seems to have come from tanks which must have been wrecked (or caused to leak) by the force of the flood itself, the water being higher than ever before. Once the very large quantity of oil was liberated the chances of ignition were plentiful. The passage of a switching engine of the New York, Pennsylvania & Ohio, near a gasoline car, is given as the cause of the explosion which started the widespread fire at Oil City. The flood of water was the result of long continued rains (there had been considerable damage and one serious train accident on account of high water previous to Sunday), but the reports speak of two special causes, a "cloud burst" and one or more broken dams. We have seen no trustworthy details as to the size or location of the dams. This is, we believe, the most destructive of human life of all the disasters that ever occurred in this country, with the exception of the Johnstown flood of 1889. It will be a curious commentary on our civilization if this next largest disaster, in the same State, shall prove to have been caused by the same sort of negligence as that.

The details of the Oil Creek disaster are hard to gather from the reports, some buildings being carried away by the flood, some burned and some damaged in both ways; but we note below such facts of special interest to our readers as we can get out of the hastily written reports. The property damage seems to have been greater at Titusville than at Oil City, but the number of lives lost probably was less. The total of the money losses is estimated variously at from one to 2½ million dollars.

Two important railroad bridges were destroyed at Oil City, besides a number of short bridges. A train of freight cars was run upon the bridge of the New York, Pennsylvania & Ohio to hold it down, but six of the cars were burned up and the bridge badly damaged by the fire. Railroad tracks in all directions from Oil City were so badly damaged by washouts that trains had not been run up to Wednesday. At Titusville, a dozen loaded freight cars on the Dunkirk, Allegheny Valley & Pittsburgh road were burned up. The bridge of the Western New York & Pennsylvania over the creek at Titusville was damaged by wreckage, a small bridge and an oil tank being carried by the flood against it. Other railroad bridges were swept away at Titusville and at Youngville, Pa.

The flood was general throughout northwestern Pennsylvania. The New York, Pennsylvania & Ohio road suffered from a large number of washouts east of Meadville. The Philadelphia & Erie was badly damaged from Erie to Kane, the washouts being numbered by the dozens. The Western New York & Pennsylvania suffered similarly between Titusville and Corry. At Corry a large stone bridge of the Erie road was washed out. The losses in Meadville, Pa., aggregated $150,000. At a point near there a broken bridge and a locomotive of the New York, Pennsylvania & Ohio were buried in 15 ft. of water. On Sunday evening a dam broke away at Union City, Pa., demolishing 30 houses and doing $100,000 damage.

Disasters by flood have occurred in several other portions of the country, and the regions that suffered so badly two weeks ago have again been the scenes of considerable damage. In the Mahanoy Valley, of Pennsylvania, the Philadelphia & Reading was badly washed on the night of June 3, and one freight train was wrecked by a washout. On the following day a flood near Washington, Pa., carried off six bridges of the Waynesburg & Washington Railroad. There was also a flood in Juanita Valley, carrying away some highway bridges.

The railroad bridge over Spring Creek at Salem, Mo. was carried away by a flood on the night of May 31. On the night of June 1 the Grand Rapids & Indiana was badly damaged for three miles near Grand Rapids, Mich., and a freight train was ditched. The St. Louis, Iron Mountain & Southern, which was still suffering from the damages of a fortnight ago, was again damaged by high water on June 6. One span of the Red River bridge at Fulton, Ark., was destroyed. The St. Louis Southwestern had a washout near Texarkana.

On the night of June 7 there was a flood at Monongahela City, Pa., destroying the bridge of the Pittsburgh, Virginia & Charleston over Pigeon Creek. Another important bridge was partially undermined.

In another column we print some figures, recently given by Mr. Bauer, electrician of the Pullman Car Company, showing the cost of electric lighting on Pullman cars. It will be seen that those who are looking for a practicable and economical system of electric train lighting can get no comfort from the data Mr. Bauer furnishes. The results in the Pullman service, as given by him, do not agree with those obtained on the Chicago, Milwaukee & St. Paul. The loss of steam pressure between the locomotive and the first car is twice as large as on the St. Paul road. On the latter they do not generally use the storage battery, nor do they find the use of a vertical single-acting engine (Westinghouse) impracticable by reason of the vibrations transmitted to the car. Neither is there any trouble experienced from short circuits due to the collection of dust and cinders on the armature and field wires. The St. Paul has been using a standard commercial (Edison) dynamo for incandescent lighting for three years. As regards the loss of active material in the storage batteries and the deterioration from handling when recharging, there are no figures to enable one to make a comparison. Some of the items of expense probably might be reduced, but these figures afford no basis for calculation, as they are given in total amounts averaged from the whole cost of a number of cars. The total cost per car per day, $1.99, is an item of interest, but its value is comparatively small, for the reasons indicated. This is probably a more economical figure than has been attained anywhere else except on the St. Paul road, but probably less so than there, though we have no figures from that road.

We have heretofore said that the use of the conduit system for electric street railroads was not only possible but quite practicable, the reason for its non-use being that it was more expensive than the overhead lines; and that if it were shown by actual experience that the conduit system was equally practicable the authorities of many cities would demand that certain portions of electric street railroads should be run on the conduit system. Curiously enough, just this thing has occurred. It seems that the promoters of electric street railroads in Philadelphia have had some trouble in getting a franchise from the city for an overhead electric system. An ordinance was passed giving them a right to build such electric lines. It was vetoed by the mayor, and then passed over the mayor's veto. Later it was repealed on account of information from Chicago, where Philadelphians have been large stockholders in the North Chicago street railroads, that a conduit system has been successful and was so pronounced by the representative of the Philadelphians in their Chicago enterprises. This representative has built too many street railroads and knows too much about them to be so rash as to make a statement of this kind without good grounds for it, and his opinion is based on the use of a conduit which has been in operation for several months. It is that on the extension of the North Chicago cable lines. This has proved itself to be beyond all doubt a practical arrangement for street railroads. Though decidedly successful, this system will require some little modification and improvement before it will be applicable to large lines. It has been shown that this line, as it is, is more reliable than the cable, there being fewer stoppages on account of breakage of parts, and less trouble in wet weather.

Several years ago the American Society of Civil Engineers adopted the 24 hour system of time notation for its official uses, and to this day its notices announce events for 13:10 o'clock and 18:30 and so on. Probably there are not four men in the Society who think in "24 o'clock," and to whom the practice is not an annoyance and an affectation. To outsiders it must seem whimsical, even if it is not a nuisance. There is, probably, no other practical result from keeping up the custom than irritating the members and amusing the world. Probably it no longer helps to create a public opinion in favor of the 24 hour notation, if it ever had such a tendency. But a man is justified in flying in the face of the common usages of civilized society only when he produces some important result by it. It might be wise for a bishop to put castor oil on his head and paint his legs and walk down Broadway; but unless he could show some prompt and substantial good to humanity as a result, his usefulness would be less for the rest of his life. So, we take it, the influence of the American Society of Civil Engineers is diminished, slightly it may be, but still diminished, by what seems to be a vain effort to change the system of notation of time of all the nations of the earth. It looks as if there was a lack of the sense of proportion. If, then, the custom is a little ridiculous and of no practical use, why not drop it?

The Missouri law requiring switches, frogs and guard rails to be properly blocked to prevent injury to train men, has recently been the subject of a lawsuit in which the supreme court of that state has given a decision which has been understood in some quarters as working to invalidate the law, but it appears from a statement in the St. Louis *Republic* that no such thing has been done, the decision in question referring to an old statute, and having no effect on the present law, which was passed in 1891. This law of 1891 is different from the former law in that it provides a severe penalty for failure to take all practicable and necessary measures to make the frogs, etc., safe for persons walking on or about them. The governor of the state, in an interview, says that it is the duty of all prosecuting attorneys throughout the state to call the attention of grand juries to any failure on the part of the railroads to observe this law.

NEW PUBLICATIONS.

General Railroad Laws of the State of New York. Compiled by R. C. Cumming and Michael Danaher. Albany: published by James B. Lyon. Price $1.

This volume has just been issued and contains the general corporation law, the stock corporation law, the railroad load, and the condemnation law, and embraces all the revisions made at this year's session of the Legislature. It is apparently printed from the same types or plates used in the Railroad Commissioners' report, Mr. Lyon being State printer. It is a handy volume without other matter, and, we suppose, will be the only publication of the sort until next January, as the next report of the Railroad Commissioners is not due until then.

Journal of the Franklin Institute, June, 1892.—This issue contains a report of the Committee on Science and the Arts recommending the award of the John Scott legacy premium and model to the Gibbon Duplex Street Railroad Track. It also contains a continuation of Mr. Lynwood Garrison's paper on the Development of American Armor Plate.

TRADE CATALOGUES.

Drawing Instruments. By the Ball-Ball Co., Frankford, Philadelphia, Pa.—The catalogue and price-list issued for 1892, the third edition of which is just out, shows a considerable variety of drafting instruments of English and American make. This house has been established in London since 1851, but is quite new in the United States, having been established in Philadelphia in 1888. A peculiar and ingenious instrument shown is the duplex ruling pen. This has two adjusting screws by which it can be set to rule lines of a fixed maximum and minimum thickness. Anything between those two limits can be ruled by simply opening the pen with the finger as it advances over the paper. The result is a very serviceable instrument for shading and for drawing tapering lines.

Description of Vauclain Compound Locomotives. Baldwin Locomotive Works, Philadelphia, Pa. This is a pamphlet of 12 pages, giving some very fair illustrations of special parts of the Vauclain compound, with descriptions, and containing, further, some suggestions for conducting simple fuel tests. In the circular accompanying the pamphlet Messrs. Burnham, Williams & Co., say that over 100 of the Vauclain compounds are now in service, and nearly 100 more are in construction. In numerous instances the original order has been followed by a supplementary order by the same company.

THE SCRAP HEAP.

Notes.

About 200 Japanese laborers have lately been put at work as track repairers on the Union Pacific in Idaho.

In the month of May eight freight crews on the Pittsburgh & Lake Erie received pay for 42 days' work each.

The fire in the Coosa tunnel, on the Columbus & Western, had not been extinguished at last accounts, and the road is still impassable.

The Boston & Maine has let a contract to Simpson & Robinson, of Minneapolis, for building a grain elevator at Mystic Wharf, Boston, to have a capacity of 1,675,000 bushels.

On the afternoon of June 1 a passenger train was thrown from the track by a high wind near Nowska, Austria. The train was overturned and 20 passengers injured.

The Union Pacific, on May 29, reduced the working hours in its shops and suspended some of the men. The Baltimore & Ohio has reduced the working hours in some of its shops.

The south bound express of the Atchison, Topeka & Santa Fe was stopped by robbers on the night of June 1 at Red Rock, I. T., but the express car had only a small amount of money, and the amount of booty secured was small.

The Philadelphia & Reading has purchased the extensive warehouses and freight yards covering about two and one-half squares, situated on Delaware avenue, Philadelphia. The consideration is said to have been between $600,000 and $700,000.

The cost of the new railroad station, embankment and bridges built at Hartford, Ct., and completed several years ago, has just been made the subject of a decision by a special commission, which has apportioned the cost between the different parties interested. The total cost of the entire work was $395,048. The commission decides that the city must pay one-half of this, and each of the two railroad companies one-fourth.

The Secretary of the Treasury has issued to the collectors of customs a circular calling attention to the fact that foreign built locomotives, running between points in foreign countries and points in the United States, have been making too long trips in this country, thus infringing the regulations under which they are admitted without the payment of import duty.

The "Alley" elevated road at Chicago was opened for business on June 6, and the cars have since been well filled with passengers. About 48,000 were carried the first day without the least hitch. The difficulty was not to get the passengers, but to provide easy means for disposing of them at the terminal stations. The northern terminus being in the southern portion of the business section of the city a very large share of the passengers use that one station. Had the facilities for handling passengers at this terminal been fully completed, at least 60,000 passengers would have been carried, as many went away rather than wait for a chance to get through the gates.

The grade crossing evil in Detroit was the subject of a paper by Mr. J. R. McLaughlin before the Detroit Real Estate Board at the last meeting of that body. The problem begins to be pressing there, as in other large cities, and the conditions seem to be similar to those found in other cities located on level ground. Mr. Mc-

Laughlin tells nothing particularly new, though it seems that he has discussed the subject carefully with the managers of most of the roads entering the city, and from this and other sources he gathers that the most feasible plan would be to make a general elevation of the railroad tracks of from 5 to 7 ft., and a depression of the streets at the crossings of about 8 ft.

Foreign Notes.

A passenger train guard named Handy was arrested at Hartlepool, England, on Sunday last, on a charge of having committed a criminal assault upon a barmaid who was traveling on his train.

The British Parliamentary Committee on the working hours of railroad employés has made a report to the effect that it is impracticable to fix a legal day, but that the companies ought to greatly reduce the working hours. It recommends that powers be given to the Board of Trade and Railway Commission to interfere in cases of excessive labor.

The matter of utilizing the water power of the river Rhine has, during the past year or two, attracted considerable attention in Germany. One power plant has already been established at Rheinfeld that cost $3,000,000, and the section between Schaffhausen and Basel is now held in view as another promising site, the available horse power being placed at about 250,000.

On May 1 it was fifty-eight years since Leopold I. gave royal sanction to the law in accordance with which the first railroad was established in Belgium, and on the whole European continent. The law was proposed on June 19, 1833, by M. Rogier, the Belgian Minister of the Interior, and was passed by the chamber on March 28, 1834, after debate which extended over seventeen sessions.

The latest of the many bridge projects for the Bosphorus, by which it has been proposed to directly connect the European continent with Asia, is that of Messrs. Giano and Courrier. The design has evidently been modeled after that of the proposed English Channel bridge between Dover and Calais. Including the approaches, the length of this Bosphorus bridge would be about 1¼ miles, the length of the bridge proper, however, being only 1 mile. The design specifies five piers at distances from one another of about 820 ft. The greatest depth of water to be encountered would be 118 ft., and the height to be attained in the interests of the shipping would be 131 ft. Up to a height of 10 metres (32.8 ft.) above the water level the piers are to consist of masonry; above that, of iron. The bridge is of the cantilever type.

Spanish-American Notes.

The new railroad from San Salvador to Santa Tecla will be opened for traffic about Aug. 1.

A new coal deposit has been discovered in the Department of San Rafael, in the Province of Mendoza, Argentine.

The Bolivian government has ordered the construction of a telegraph line from Oruro to Cochabamba, at a cost of $50,000.

The Brazilian government has asked the Lloyd Braziliero Navigation Co. to make a reduction of 50 per cent. on freights upon food products.

Mr. Chas. R. Flint has sent an engineer to Bogotá, Colombia, with materials necessary to complete the system of street car lines in that city.

Salvador has offered the South American Steamship Co. a subvention of $6,000 a year for calling at the ports of La Union, La Libertad and Acajutla.

In 1891 the suburban trains of the Central Railroad in Brazil carried between Rio de Janeiro and suburban towns 7,866,852 passengers, against 5,304,400 in 1890, and 4,193,436 in 1889.

Two small light-draft steamers of galvanized steel, of 100 tons each, were recently built at Wilmington, Del., for use ont he Rio Magdalena, and the Canal del Dique, Colombia. They were shipped to Colombia in sections.

The Sao Paulo Railroad, Brazil, carried 451,000 tons of freight, and 387,000 passengers, during the year 1891, the increase over the previous year being 40 per cent. in freight, and 30 per cent. in passenger traffic.

A commission of engineers is engaged in surveying the Martin Garcia channel at Rosario, Argentine, preparatory to deepening this waterway. During the last two months there has been a very large increase in shipments from the port of Rosario.

The earnings of the Costa Rica Railway from July 1 to Dec. 31, 1891, were $592,000, and from Jan. 1 to April 10, 1892, they amounted to $581,000. The company proposes to expend $100,000 this year in the purchase of new rolling stock, in the erection of bridges, and in the purchase of new rails and miscellaneous supplies.

The firm of J. F. Stant & Co., of Buenos Ayres, has applied to the government for permission to build two sea walls at the entrance of the Riachuelo channel and Madera Port. The sea walls are to be 800 metres long, built of concrete, leaving a channel between them of 150 metres. The object sought is the reclamation of land on each side of the channel.

World's Fair Notes.

Great Britain is the first foreign country to begin the construction of its World's Fair building.

Half-rates each way have been granted by the Transcontinental Association on all exhibits from the Pacific Coast states intended for the World's Fair.

The material for the permanent iron bridges across the canal between the Electricity and Manufactures buildings is on the ground, and work has been started on one of them.

On electric generators for furnishing the entire plant much money has been saved. The generators must have a capacity of 3,500 H. P. Of this amount 1,800 H. P. will cost $2.50 per H. P. The remaining 1,700 H. P. will cost $1 per H. P.

A firm in Germany noted for the erection of extremely lofty chimneys having applied for permission to put up such a chimney on the Exposition grounds, their request has been granted. The firm will be permitted to erect, probably near Machinery Hall, a brick chimney 115 ft. high and 6 ft. interior diameter. This lofty chimney is, so far as has yet been decided, the only brick chimney which will be put up on the grounds, all the others being iron.

The Department of Transportation have been notified that four representatives of the Krupp manufactory left Bremen last week to make definite arrangements for the Krupp exhibit. It will be one of the largest individual exhibits at the Exposition. The amount to be expended by the Krupps will approximate $300,000. In the exhibit at Chicago will be shown a gun weighing 130 tons.

An average of 6,016 men were employed at Jackson Park during May. During 23 days work was generally stopped on account of rain. Nine state buildings and one foreign building are under way. A review of the actual progress of all the main buildings is as follows: Machinery Hall led the list in May in amount of lumber placed, 988,000 ft. An average of 340 men were employed. The outer and inner walls of the main building are up to the gallery line on the north and east sides. The Machinery Hall annex is nearly completed. The roof is on, the tower roofers are at work, and the skylights are more than half finished. The iron workers have begun on the third tier of roof trusses for the main entrance. The Electricity Building is growing rapidly, and in the Art Building the walls are finished. Work is progressing on the Peristyle, Casino and Music Hall, the pile foundations for the Music Hall being finished. The roof carpentry work is done on the Agriculture Building, the large roof trusses are all in place, and the superstructure of the annex is being raised. One thousand workmen are at work on the Manufacturers' Building. Eight of the 22 trusses are up. Work on the minor roof trusses will be commenced at once. The iron work of the outer and inner dome of the Administration Building is practically done. On the Horticulture, Fisheries and Woman's Buildings painters, plumbers and plasterers are at work. The Mines Building has been accepted from the carpenter and iron contractors. The Transportation Building is nearly finished. All it needs is the exterior covering on the dome and the north and south entrances. On the Government Building the ironworkers on the dome are putting in the last section. The models for the sculpture groups are completed.

LOCOMOTIVE BUILDING.

The Eastern of Minnesota (Great Northern) is asking bids of two 6-wheel switching engines.

The Baltimore & Ohio has given a contract for 10 high-speed passenger locomotives to the Baldwin Locomotive Works.

The Baldwin Locomotive Works are building 10 consolidation engines and five 10-wheel engines for the Norfolk & Western.

CAR BUILDING.

The North Carolina Car Co., of Raleigh, N. C., is completing a contract for freight cars for the Seaboard air line, and is now turning out a number of stock cars for the road.

The Canadian Pacific will soon have in service 40 new sleeping cars of an improved design. Twelve of the cars will be placed on the "Soo" line, and the balance on the Trans-Continental Service.

The Chicago, Burlington & Quincy shops, at Aurora, recently turned out two complete dining cars within 60 days from the receipt of the order. Material for a third dining car is being laid out, to be completed in the same time. The shop has orders for ten standard suburban cars, with Chalender plate truss, Adams & Westlake lamps and Hale & Kilburn seats; and five standard baggage cars are also under construction.

The following new passenger car orders includes all the larger contracts awarded in the last few weeks. Some of these have already been published but are given now to make the list more complete. The Chicago, Burlington & Quincy has ordered 124 cars, of which 55 cars with tête-à-tête reclining seats will be built by Pullman, and 49, with high back head-roll seats, by Jackson & Sharp. Ten suburban cars with rattan seats will be built at the Aurora shops. The Illinois Central is having 80 suburban cars built at Pullman; the Manhattan Elevated, 25 at Harlan & Hollingsworth; the Chicago & South Side Rapid Transit, 100 at Jackson & Sharp, of which over 25 have been delivered, and the Atchison, Topeka & Santa Fe is having 20 cars built by the Barney & Smith Mfg. Co. with tête-à-tête reclining seats. The Pittsburgh, Cincinnati, Chicago & St. Louis, has ordered 25 additional cars from the Ohio Falls Car Co. That firm is also building six cars for the New York, Ontario & Western, five for the Minneapolis & St. Louis, and two chair cars for the Louisville, New Albany & Chicago. The Barney & Smith Mfg. Co. has delivered 10 out of its order for 50 day cars for the Cleveland, Cincinnati, Chicago & St. Louis, with Wheeler seats. The remaining 40 cars are to have Hale & Kilburn head roll seats. All the of other cars enumerated above are also to have Hale & Kilburn seats.

BRIDGE BUILDING.

Boston.—Sealed proposals for building the Allston Bridge will be received at the office of the City Engineer, 50 City Hall, Boston, until Monday, June 13.

Brainerd, Minn.—The bridge to be built for the Brainerd & Northern Minnesota at this city will be over 600 ft. in length.

Brazoria, Tex.—The Commissioners' Court received bids to build two iron bridges, one across Bastrop Bayou and one across Chocolate Bayou, from the following companies: Wisconsin Bridge Co., Groton Iron Bridge Co., Chicago Bridge & Iron Co., Youngstown Bridge Co., King Bridge Co., Missouri Valley Iron Works Co. and Geo. E. King Bridge Co. The contract for both bridges was awarded to the Youngstown Bridge Co. at $16,000, payable in county 25-year 6 per cent. bonds.

Brooklyn, N. Y.—The State Supreme Court has ordered the payment to the Town Board of Gravesend of $3,200 for a bridge over Sheepshead Bay.

Buffalo, N. Y.—The Commissioners of Public Works have decided that while they will receive bids for the construction of the Elmwood avenue bridge, and for the extension of the avenue, they will withhold the contract until the necessary land is deeded to the city, the streets opened, etc.

The Western New York & Pennsylvania is renewing its bridges with steel structures. A contract has been made with the Pencoyd Bridge Works of Philadelphia for 12 steel bridges to be put up this summer. Two will be built on the Buffalo division, three on the Rochester division, seven on the Pittsburg division. These are all to replace wooden bridges. Last year seven new iron bridges were put in.

The Park Commissioners have instructed Superintendent McMillan to procure plans for a 60-ft. bridge over Scajaquada Creek on Humboldt Parkway, to be constructed of stone or iron, and submit them to the Board at its regular meeting this week.

Chestertown, Md.—The county commissioners this week awarded contracts for building three iron bridges for $4,850.

Cincinnati, O.—Ferris, Kaufman & Co., of Pittsburgh, are working on the plans for a bridge between Cincinnati and Covington, Ky. It will be altogether about one mile long, have one cantilever span 1,500 ft. long, and will cost $2,500,000.

Florence, Ala.—Chief Engineer Montfort, of the Louisville & Nashville, made an examination last week of the site proposed for the new Tennessee River bridge at Florence, and it is expected that the plans for structure will soon be ready.

Ft. William, Can.—The Canadian Pacific has let contracts to replace about 12 wooden bridges on the line between Ft. William and Rat Portage with stone abutment bridges, and the work will begin immediately.

Layden, Ill.—The County Board and Town Board have let the contract for an iron bridge over the Des Plaines River to the Massillon Bridge Co. at its bid of $2,095.

Little Falls, N. Y.—The highway commissioners have decided to ask for bids for an iron bridge 36 ft. wide to replace the stone bridge over the Mohawk River referred to last week. They will award a contract for the iron bridge if it can be built for $14,000. The commissioners have estimates from the Elmira Bridge Co. for a bridge 50 ft. wide to cost $18,000, and from the King Bridge Co. estimates from $12,000 to $19,000.

New London, Conn.—The Connecticut Railroad Commissioners have ordered all the old Howe truss bridges on the New London Northern road to be substituted by new and stronger structures at an early day.

New York City.—At the annual meeting of the Bridge Company the following directors were elected: John B. Kerr, W. Wetmore Cryder, William Bell, W. F. Dunning and Simon Rothschild, of New York; Daniel N. Lockwood, Buffalo, N. Y.; Williard H. Nase, Matawan, N. J.; John C. Adams and John T. Moore, Newburg; H. B. Archer, Yonkers, and Charles Swan and James Langan, of Brooklyn. Vice-President Cryder reported that since the last meeting the engineers had nearly completed the surveys for the route and plans for the bridge and viaduct, and that the plans for the union station are in the hands of the architect.

Ottawa, Ont.—The City Engineer, Ottawa, is calling for tenders for the iron superstructure of a bridge of four spans, to be erected across the Rideau River at Cummings' Island, connecting the city of Ottawa and the county of Carleton.

Philadelphia.—The Phœnix Bridge Co., of Phœnixville, is erecting an iron foot bridge over the Reading Railroad tracks on Huntingdon street, extending from the west side of Thirteenth street to the east side of Broad street. Its total length will be 511 ft. The bridge will be 12 ft. wide, and average in height 20 ft. It will rest upon truss towers of angle iron, on substantial masonry foundations. The bridge will have a number of viaduct spans running from the eastern end, and two spans between the railroad tracks and Broad street, while the through span over the tracks will be 144 ft. in length.

Pittsburgh, Pa.—A charter for the West Elizabeth Bridge Co., of Pittsburgh, was filled in Pennsylvania last week. The names of the incorporators are not given.

Thompsonville, Conn.—The Suffield & Thompsonville Co., will receive bids until June 27, for constructing the substructure the superstructure of an iron or steel bridge across the Connecticut River between Thompsonville and Suffield, Conn. The distance between abutments is to be 1,000 ft., and bids are called for upon a bridge having a clear roadway of 18 ft., and upon a bridge having a clear roadway of 20 ft. Bidders will be required to make their own surveys, and to determine for themselves the length of spans and location of piers.

Trenton Falls, N. Y.—The steel bridge of the Adirondack & St. Lawrence across the West Canada Creek was completed last week. The bridge has one 60-ft. plate girder span and two lattice spans, 200 ft. and 90 ft. long, respectively. The height of the bridge is 76 ft., and it has probably the longest span of ballasted floor yet built. The bridge was built by the Elmira Bridge Co., and cost about $50,000. It was described in the *Railroad Gazette* of Feb. 19.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, quarterly, 2 per cent., payable June 30.

Boston & Lowell, semi-annual, 3½ per cent., payable July 1.

Chicago Junction Railways & Union Stock Yards Co., semi-annual, 3 per cent. on the preferred stock and 4 per cent. on the common stock, payable July 1.

Chicago & Eastern Illinois, quarterly, 1½ per cent. on the preferred stock, payable July 1.

Chicago & Northwestern, quarterly, 1¾ per cent. on the preferred stock, and semi-annual, 3 per cent. on the common stock, both payable June 24.

Chicago, St. Paul, Minneapolis & Omaha, semi-annual, 3½ per cent. on the preferred stock, payable July 20.

Connecticut River, quarterly, 2 per cent. on the capital stock, payable July 1.

New York & Harlem, semi-annual, 4 per cent. on the capital stock, payable July 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago Junction Railways & Union Stock Yards Co., annual, Jersey City, N. J., July 7.

Duluth & Winnipeg, special, Duluth, Minn., June 21.

Fort Worth & Trinity Valley, annual, Fort Worth, Tex., June 25.

International & Great Northern, special, Palestine, Tex., July 14.

Northern (N. J.), annual, Englewood, N. J., June 15.

Oregon Railway & Navigation Co., annual, Portland, Ore., June 20.

Paducah, Tennessee & Alabama, special, Puducah, Ky., June 15.

St. Joseph & Grand Island, annual, Elwood, Kan., June 14.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railroad Telegraph Superintendents' Association* will hold its annual convention at Denver, Col., June 15 and 16. P. W. Drew, 535 Sixty-seventh street, Englewood, Ill., is Secretary of the association.

The *Master Car Builders' Association* will hold its annual convention at Congress Hall, Saratoga Springs, N. Y., June 15.

The *American Railway Master Mechanics' Association* will hold its annual convention at Congress Hall, Saratoga Springs, June 20.

The *American Association of General Baggage Agents* will hold its next annual meeting at Mackinac Island, Mich., July 20.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston Mass., on the second Monday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November. By special resolution the next meeting will be held in April.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul. Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Engineers and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

Association of American Railway Accounting Officers.

The association held its fourth annual meeting in Chicago on May 25 and 26, 1892. There was a very good attendance. Interesting papers were read by Mr. Oliver W. Mink, Comptroller of the Union Pacific, on "Uniformity in Accounting," and by Mr. Carlton Hillyer, auditor of the Georgia Railroad, on "The Search for Error." On Thursday, the 26th, the members and their friends visited Jackson Park. The Illinois Central tendered a special train and the Exposition Company provided observation cars at the grounds.

The election resulted as follows:

President, D. A. Waterman, Michigan Central, Detroit; First Vice-President, G. W. Booth, Baltimore & Ohio, Baltimore; Second Vice-President, J. O. Clifford, Chicago & Northwestern, Chicago; Secretary and Treasurer, C. G. Phillips, 22 Fifth avenue, Chicago.

Executive Committee: J. C. Welling, Illinois Central, Chicago; M. Riebenack, Pennsylvania, Philadelphia; G. L. Lansing, Southern Pacific, San Francisco, Carlton Hillyer, Georgia Railroad, Augusta, C. I. Sturgis, Chicago, Burlington & Quincy, Chicago; M. C. Healion, Chicago, St. Paul & Kansas City, St. Paul; E. Young, Union Pacific, Omaha; S. Little, Denver & Rio Grande, New York City.

Engineers' Club of St. Louis.

The club met June 1 at the club rooms, Vice-President Crosby in the chair, and 20 members and 3 visitors present. Mr. Flad presented diagrams showing loss of head for the flow of gases through pipes of varying diameters and for varying velocities. Discussion followed by Messrs. Wheeler, Colby, Flad and Love. Mr. Ockerson exhibited blue print diagrams showing the effects of erosion on the Mississippi River banks, from Cairo to Donaldsonville, from 1877, 1883 to 1892. The diagrams showed graphically the annual amount of caving per mile of river considered in sections of ten miles. Discussions followed by Messrs. Colby, Wheeler, Flad and Crosby.

For the next meeting, Sept. 21, a paper on the "Methods and Results of Precise Leveling," by Mr. O. W. Feguson, is announced.

Master Car Builders' Association.

The programme for the Twenty-sixth Annual Convention to be held at Saratoga Springs, N. Y., June 15, has been issued by Secretary John W. Cloud. It is accompanied by advance sheets of the reports to be presented. These are catalogued as follows, the chairman of the committee being named after each topic:

1. Joint Inspection.—A supplementary set of interpretations and illustrations of the rules of interchange. A. M. Waitt.

2. Air-Brake and Signal Instructions.—Review of the instructions proposed at last convention. E. W. Grieves.

3. Cast Iron Wheels.—Investigation of improvements being made in the manufacture of wheels, so as to secure greater uniformity in quality, in depth of chill and in distribution of metal for proper balance. Geo. W. West.

4. Freight Car Truck Frames.—Report upon the relative advantages of swinging and rigid bolsters, and upon the Fox pressed steel truck as compared with the prevalent forms of freight car trucks. G. F. Wilson.

5. M. C. B. Automatic Coupler Standards and Limits.—Consideration of the standard measurements, and whether any additional or other measurements are desirable as standard; report upon proper limits of variation to be allowed from standard measurements. J. S. Lentz.

6. Steam Heating and Ventilation of Passenger Equipment Cars.—Report upon the general progress and the efficiency of different systems; proposed standard location of ends of train pipe, and proposed standard connection for a union between the hose and pipe, so that one style of coupling may be readily removed and another substituted in its place. J. N. Barr.

7. Steel-Tired Car Wheels.—Report upon relative merits of solid cast and wrought centres, and of plate centres bolted to hubs and tires. R. E. Marshall.

8. Wheel Guarantee.—Report on the communication from the Wheel Manufacturers' Association, read at last convention, with recommendations. J. J. Hennessey.

9. Steel Plate and Malleable Iron in Car Construction.—A standard for stake pockets and method for attaching to cars. Also standards for centre plates showing one for wooden transoms. Drawings accompany the report, Wm. Forsyth.

10. Standards of the Association.—Report on the standards already adopted by the association, and recommendation as to what measures are expedient to secure their general adoption and use, R. H. Soule.

11. Metal for Brake Shoes.—G. W. Rhodes.

12. Standard Test of Air Brakes.—Report proposing tests which air brakes should successfully pass before being considered suitable for use on cars in interchange. G. W. Rhodes.

Thursday, June 16 will be devoted to the Revision of the Rules of Interchange, unless otherwise ordered by the convention on Wednesday. Members who have questions to propose for discussion at the convention should hand them to the secretary as early as possible.

Rensselaer Polytechnic Institute.

The programme for commencement at this school is as follows:

June 10, 13 and 14, Reading of Theses by the graduating class; Sunday, June 12, Baccalaureate Sermon by Rev. T. A. Snively; June 14, Alumni dinner at 7 p. m. at the Troy Club; June 15, commencement alumni meeting in the morning at 10 o'clock and graduating exercises at 8 p. m. William Metcalf, of the class of '58, of the Crescent Steel Works, Pittsburgh, Pa., will deliver the address to the class, and President John H. Peck will also deliver an address.

There will be a ball, after the degrees have been conferred, which will be given under the auspices of the R. P. I. Union. There will be 33 graduates.

The American Society of Civil Engineers.

As we go to press the convention of this Society is in session at Hygeia Hotel, Old Point Comfort, Va. Members from New York and the northeast went down Tuesday by a special train over the "Cape Charles Route." Others went by rail to Baltimore and thence down the Chesapeake Bay; and still others went by sea. From the west and south they went, singly and in groups, by various routes. The programme as usual at these very pleasant conventions is made up in just proportions of bread and sack. Wednesday there were two sessions during the day; at 4:30 there was a special review of the Artillery School at Fort Monroe, and the evening was given to the President's address. Thursday there was an excursion to the Navy Yard at Portsmouth and to Virginia Beach. Friday, there was to be a business meeting in the morning, a session in the afternoon, artillery practice with sea coast guns and a dress parade at the Fort. For Saturday the programme is a visit to the Newport News Dry Dock, and the launch of the steamer "El Norte" and the society banquet in the evening. Monday, the final sessions are to be held.

The Publication Committee has issued a circular restricting the advance publication of papers and discussions to such abstracts as are furnished or approved by the Secretary. It is not probable, therefore, that we shall report the proceedings of the convention at much length,—certainly not, unless the official interpretation of the circular modifies its letter.

PERSONAL.

—Mr. George Findlay, General Manager of the London & Northwestern Railway, has been knighted by Queen Victoria.

—Mr. L. L. Gilbert, of the Pennsylvania Company, has been elected President of the Association of Railway Claim Agents.

—Mr. R. C. Houston, for six years General Claim Agent of the Louisville, New Albany & Chicago, has resigned, and the office has been abolished.

—Mr. George B. Reeve, Traffic Manager of the Chicago & Grand Trunk, left Montreal this week for a two months' vacation trip in Europe.

—Mr. A. P. Warrington, Division Freight Agent of the Norfolk & Western at Winston-Salem, N. C., has tendered his resignation, to take effect July 1, to engage in other business at Norfolk, Va.

—Mr. Horace Booth has resigned as General Freight and Passenger Agent of the East Line & Red River road, to accept the position of General Agent of the International & Great Northern, with headquarters at Houston, Tex.

—Mr. John V. Young has been appointed agent and electrician at Boston for the Union Switch & Signal Co., succeeding to the vacancy caused by the death of Mr. Charles A. Scott. His office will be at 620 Atlantic avenue, Boston, Mass.

—Mr. Thomas C. Clarke, of New York, has been appointed engineer to prepare the plans and supervise the construction of the new bridge over the Harlem River at Third avenue, New York, which is to be built by the Department of Public Works.

—Mr. Joseph H. Franklin, previously station master at the Grand Central Station, New York, has been appointed General Manager in place of Mr. C. H. Platt, who has been appointed General Superintendent of the New York, New Haven & Hartford.

—Mr. G. H. Turner, Assistant General Manager of the Midland Railway Co., of England, has been appointed General Manager, succeeding Mr. John Noble, who has been in poor health for some time. Mr. Noble has been elected a director of the company.

—Mr. W. J. Reilly, Purchasing Agent of the Buffalo, Rochester & Pittsburgh, has resigned, and the office has been abolished. Mr. Reilly took the position when Mr. W. A. Baldwin became Vice-President, acting as his assistant until his appointment as Purchasing Agent.

—Mr. M. E. Wallace, for the past two years Mechanical Engineer for the Gould Coupler Co., has resigned to become Chief Draftsman of the Chicago, Burlington & Quincy, under William Forsyth, Mechanical Engineer, at Aurora. Mr. Wallace was formerly connected with the mechanical department of the Erie in various capacities.

—Mr. H. R. Dill has tendered his resignation as Superintendent of the main stem of the Central of Georgia, to take effect June 20. His action in tendering his resignation is due to personal reasons. He has filled the position he resigns for two years with high ability. Mr. Dill was formerly Division Superintendent of the Chesapeake & Ohio, and he may return to that road.

—Mr. Clarence G. Wilson, Superintendent of the Iowa lines of the Chicago, Burlington & Quincy, was drowned June 1, at Dudley, Ia. He was examining the extent of the damage done by a washout, and while crossing a trestle slipped and fell into the creek. All efforts to resuscitate him were unavailing. Mr. Wilson was about 42 years old, and he leaves a widow and two children. He had been in the service of the Burlington over 20 years, beginning in 1876 as a station agent at Quincy, Ill. He was station agent at East St. Louis during the St. Louis strikes, and was soon after made Assistant General Freight Agent at Chicago. In 1888 he was made Superintendent of the Chicago Terminals, and in July, 1890, he was appointed Superintendent of the Iowa lines.

—Mr. Andrew B. Kerr, Supervisor of the Allegheny Valley, died at his home at Johnston station on that line, June 4, after a short illness, in his 67th year. He was born in Scotland, and began his railroad career there, following that pursuit for two years before leaving his native land. Emigrating to America, he became a section foreman on the Pittsburgh, Fort Wayne & Chicago. Entering the employ of the Allegheny Valley six years later, he laid the first rail put down in the construction of that road. After serving for three years as a section foreman, he was appointed Supervisor, which position he held until his death, a period of 34 years. His service was not only very long, but active to a remarkable degree. He was a man of marked ability, and of sterling integrity.

—The divisions into which the Central of Georgia has been divided for operating purposes have been changed from three to four divisions, reverting to the organization as it stood before the lease to the Richmond & Danville. The changes involve the transfer of Superintendent D. D. Curran, of Macon, to Columbus, Ga., and of Mr. B. C. Epperson from the South Carolina division to the Southwestern division at Macon, as detailed elsewhere, and also the appointment of a new Superintendent, T. S. Moise, now train master at Macon, whose headquarters will be at Augusta, Ga. Mr. Moise is now about 39 years old, and has been in railroad service for the last 12 years. He was for some time yard master of the Central of Georgia at Montgomery, and in 1889 was made train master at Columbus. In 1890 he became Superintendent of the Savannah & Atlantic now controlled by the Central of Georgia, and he was made train master at Macon at the time of the Richmond & Danville lease.

—Mr. A. W. Gibbs, Superintendent of Motive Power and Machinery of the Central of Georgia, resigned last week, and the office has been abolished. Mr. Gibbs was formerly Master Mechanic of the Richmond & Danville at Alexandria, Va., and was appointed Superintendent of Motive Power of the Central of Georgia in August, 1890, soon after the resignation of Mr. T. L. Chapman. The duties of the position, it is understood, are to be divided between the General Superintendent and the new Master Mechanic at Savannah, J. J. Anderson, who has been foreman of the Macon shops for the last two years. Mr. Anderson was born in North Carolina and after an apprenticeship as a machinist went to Texas in 1873 and was a locomotive engineer on the Texas & Pacific. He was afterward connected with Mississippi roads and the Western of Alabama. From 1877 to 1883 he was

in the service of the Atlanta & Charlotte Air Line. Returning again to the Western of Alabama he continued in its service until October, 1890, when he was made General Foreman of the shops at Macon.

—Major George A. Whitehead, General Freight Agent of the Central of Georgia, resigned last week. His retirement was a surprise, and no reason has been given except that of economy, it having been decided to consolidate the offices of General Passenger and Freight Agent. Maj. Whitehead has been connected with the Central of Georgia continuously for 20 years. He was appointed General Freight and Passenger Agent in 1882, and when the positions were separated seven years later he retained the office of General Freight Agent. Mr. Winburn, his successor, was formerly Division Freight and Passenger Agent of the Richmond & Danville at Asheville, N. C., and was afterward connected with the Central of Georgia, but resigned soon after the lease to the Richmond & Danville. Maj. W. F. Shellman, the present Traffic Manager of the Central of Georgia, was also Traffic Manager of the Central before the lease, and resigned when it took effect. When he became General Manager of the Columbus Southern he appointed Mr. Winburn his chief clerk, continuing him in that capacity; when he was reappointed Traffic Manager of the Central of Georgia.

—Mr. John B. Morford, who has been Superintendent of the Canada and Michigan Midland divisions of the Michigan Central since 1883, resigned this week, and has been succeeded by Mr. O. F. Jordan, who has been roadmaster of the division for eight years. Mr. Morford has had an interesting railroad career, beginning as a water boy on the New York & Erie road in 1851. He was afterward brakeman and conductor on several Eastern roads and chief train dispatcher of the Morris & Essex between 1866 and 1870. He was then freight agent for the New York Central at New York, and depot master of the Grand Central station until 1872, when he was appointed General Superintendent of the Long Island road. From 1875 until 1882 he was then successively Superintendent of Lighterage and Ferries of the Central of New Jersey, when he became Superintendent of Construction on the Sabine & Eastern Texas. He left that position in April, 1883, to become Assistant Superintendent of the Michigan Central, and in December he was made Division Superintendent. Mr. Morford's resignation is on account of ill health, and he will spend several months in Colorado. Mr. Jordon, the new Superintendent, was born in England, but he has lived in Canada the greater part of his life. He is now about 43 years old. He entered the service of the Detroit, Grand Haven & Milwaukee Railroad as section laborer, and has advanced by industry and ability.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio Southwestern.—J. G. Neuffer has been appointed Master Mechanic, vice E. Evans, resigned. He was formerly Supervisor of Trains and Signals. His headquarters will be at Chillicothe, O.

Canada Atlantic.—At the annual meeting last week the following were elected directors: C. J. Booth, C. B. Powell, J. Booth, G. H. Perley, E. C. Smith, N. Mackintosh and W. Anderson. C. J. Booth was elected President, and G. H. Perley, Vice-President.

Central of Georgia.—D. D. Curran who has been Superintendent of the Southwestern Division, with headquarters at Macon, Ga., has been transferred to the Savannah & Western Division, of which he was formerly Superintendent; his headquarters will will be at Columbus, Ga. B. C. Epperson has been transferred to the Southwestern Division, and will be succeeded as Superintendent of the South Carolina Division by T. S. Moise, whose headquarters will be at Augusta, Ga.

W. A. Winburn who has recently been General Passenger Agent has been appointed General Freight Agent, also J. J. Anderson has been appointed Master Mechanic, with headquarters at Savannah, Ga.

Central Ontario.—J. D. Riddell, Chief Clerk to Assistant Superintendent Tiffin, of the Grand Trunk, at Stratford, Ont., has been made Superintendent of the Central Ontario, with headquarters at Trenton, Ont. Robert Fraser has heretofore been Secretary and Treasurer and Superintendent.

Charleston, Clendennin & Sutton.—The following are now the officers of this company: F. W. Abney, President; J. D. Barnes, Treasurer; John B. Floyd, Secretary and Chas. K. McDermott, Chief Engineer. The principal office is at Charleston, W. Va.

Chicago & Eastern Illinois.—Stockholders of the company held their annual meeting at Chicago, June 1. The following directors were elected: H. H. Porter, M. J. Carpenter, O. S. Lyford, and C. W. Hillard, of Chicago; A. R. Flower, Benjamin Brewster, R. M. Hoe, and Henry Seibert, of New York; H. H. Stevens and George H. Ball, of Boston, and J. G. English, of Danville, Ill. The directors elected the following officers: Chairman of the Board, H. H. Porter; President, M. J. Carpenter; Vice-President, O. S. Lyford; Second Vice-President and Treasurer, C. W. Hillard; Secretary, H. A. Rubidge; Assistant Treasurer, A. R. Flower; Assistant Secretary, H. J. Messing.

Chicago & Northwestern.—At the annual meeting at Chicago, June 2, the following were elected directors for three years: Horace Williams, Frederick L. Ames, John M. Burke, Marvin Hughitt and N. K. Fairbank. Byron L. Smith was elected for a term of one year, to succeed the late William L. Scott. The board afterward elected officers as follows: Chairman of the Board, Albert Keep; President, Marvin Hughitt; Vice-President, M. L. Sykes; Assistant Secretary and Treasurer, S. O. Howe and J. B. Redfield.

Chicago, Rock Island & Pacific.—W. K. McFarlin, Superintendent of Maintenance and Construction Lines West of the Missouri River, with headquarters at Topeka, Kan., on June 1 assumed like jurisdiction over lines in Illinois, with headquarters at Chicago.

Charles Kennedy, General agent at Portland, Ore., has been transferred to Omaha, with the title of General Northwestern Passenger Agent, vice J. L. DeBevoise General Agent, transferred.

Chicago, St. Paul, Minneapolis & Omaha.—The annual meeting of the stockholders of the company was held at Hudson, Wis., June 4. The following directors were elected: For three years.—Albert Keep, Cornelius Vanderbilt, William K. Vanderbilt, and H. McK. Twombly. For an unexpired term.—Bryon E. Smith. The directors elected the following officers: President, Marvin H. Hughitt; Vice-President and Treasurer, L. M. Sykes; Secretary, E. E. Woodman.

Chicago & Western Indiana.—At the annual meeting of the stockholders at Chicago, June 8, the old board of directors and the present officers were re-elected.

Clearfield & Mahoning.—The directors of this new Pennsylvania company are: J. M. Grosch, of Ridgway, Pa., President: H. M. Powers, S. A. Rote, M. S. Kline, E. C. Powell; John S. Whitmore, all of Ridgway; J. E. Merris, Du Bois, Pa.; O'D. Iselin, Adrian Iselin, and Henry Fatio, New York; John H. Hocart, Brooklyn; Oscar Grisch, Hoboken, N. J., and L. W. Robinson, Punxsutawney, Pa.

Cleveland, Cincinnati, Chicago & St. Louis.—The following appointments were announced by the Superintendent of Motive Power last week: F. M. Lawler appointed Master Mechanic of the Chicago, Indianapolis & White Water divisions, with headquarters at Brightwood, Ind., vice O. H. Jackson, resigned; G. S. McKee, heretofore Assistant Master Mechanic at Indianapolis, appointed Master Mechanic of the St. Louis division, with headquarters at Mattoon, Ill., vice F. M. Lawler, transferred; J. H. Berry, promoted to the position of Master Mechanic, Delaware, O., with charge of all motive power matters pertaining to the Cincinnati division.

Colorado.—The stockholders of the company at a meeting at Denver June 1 elected C. H. Toll, J. L. Jerome, Joseph Milner, George W. Ballery, W. R. Barbour, W. D. Woodman and R. J. McClure directors. The company was organized about ten years ago to build a road between Denver and Salt Lake. No work had ever been done.

East Line & Red River.—J. W. Chatham has been appointed General Freight and Passenger agent, vice Horace Booth, resigned. His headquarters will be at Greenville, Tex.

Erie & Wyoming Valley.—The company chose the following officers at Scranton, June 7: President, John B. Smith, of Dunmore; Secretary, Morris B. Mead, South Orange, N. J.; Treasurer, George B. Smith, of Dunmore; Directors, John B. Smith, George H. Catlin and Samuel Hines, of Scranton; John King and E. Thomas, of New York; E. Mead, of South Orange, N. J.; A. H. McClintock, of Wilkesbarre, Pa.

Hudson Suspension Bridge & New England.—At the annual election of the railroad in New York, June 6, the old Board of Directors were re-elected with two exceptions. Grinnell Burt, of Warwick, N. Y., took the place of William Jaffreys, and Norman Bentley, of New York, succeeded Mr. Grinnell, of Rhode Island.

Illinois, Indiana & Michigan.—The first board of directors of this company is as follows: Jonathan W. Crumpacker, of Laporte, Ind.; William Alden Smith, Thomas Hefferson, George Hefferen, Harrison F. Grover and Frank Jewel, of Grand Rapids, Mich., and James Austin, of Detroit.

International & Great Northern.—A circular was issued June 1 announcing the appointment of J. D. Trammell as Resident Engineer of the road, with headquarters at Palestine, vice J. Tobin, who has been assigned to other duties. Mr. Trammell has been connected with the Texas & Pacific.

Long Island.—Watson W. Apgar, a conductor on the road, has been appointed Superintendent of Parlor Cars, with office at Long Island City, N. Y.

Mexican National.—G. N. Cullom has been appointed Acting Assistant General Freight Agent, with office in the city of Mexico. He succeeds Adam Hoffman, who resigned recently to become General Passenger and Freight Agent of the Monterey & Gulf. Mr. Cullom has been employed in the auditor's office for the past three years.

Mexican Nprthern.—At the annual meeting of the stockholders of the company, held in New York this week, the old board was re-elected. The following are the officers chosen: Robert S. Towne, President; A. R. Meyer and N. Witherell, Vice-Presidents; A. Foster Higgins, Treasurer, and C. J. Nourse, Jr., Secretary,

Michigan Central.—O. F. Jordan has been appointed Division Superintendent at St. Thomas, Ont., to have charge of the Canada Division, vice J. B. Morford, resigned.

Milwaukee, Lake Shore & Western.—At the annual meeting of the company at Milwaukee, June 2, the old Board of Directors was re-elected with the exception of Samuel S. Sands, who is succeeded by Mr. Newman, Mr. Sands having retired. The following officers were elected: President, Marvin Hughitt; Vice-President and Treasurer and Assistant Seeretary, M. L. Sykes, New York; Assistant Treasurer, A. D. Alibone, Milwaukee, and S. O. Howe, New York; Secretary. Alfred L. Cary, Milwaukee.

Minneapolis & St. Louis.—S. M. Lohren has been appointed Purchasing Agent, vice W. B. Palmer, resigned.

Missouri, Kansas & Texas.—No appointment having been made to the office of General Manager, employes heretofore reporting to that official will be under the jurisdiction of T. C. Purdy, Second Vice-President, whose headquarters are at Parsons, Kan.

Newport News & Mississippi Valley Co.—J. W. Baird having resigned the Auditorship of the Western Division, C. F. Krebs has succeeded him. His headquarters will be at Louisville, Ky.

New York, New Haven & Hartford.—The official circular announcing the appointment of C. H. Platt as General Superintendent has been issued, the appointment taking effect from June 1. His jurisdiction will extend over the transportation, motive power and car departments, with headquarters at New Haven, Conn.

New York, New Jersey & Eastern.—The directors of this company, chartered in New York this week, are as follows: Everett R. Reynolds and F. M. Kelly, of New York City; William J. Hehre and Alfred N. Hehre, of Hollis, N. J.; Charles MacVeagh, of Morristown, N. J.; Frederick Cook, of Orange, N. J.; William J. Kelly and Pierson A. Brown, of Brooklyn, and Daniel S. Voorhees, of Woodbridge, N. J. E. R. Reynolds is assistant to President Austin Corbin, of the Long Island; Messrs. William J. Kelly, William J. Hehre and Frederick Cook are directors of the New York & New Jersey Terminal Co., recently organized in the interest of the Long Island.

New York & South Beach.—The following directors have been elected: Edward Wemple, Charles R. de Freest, Frank Campbell and James B. Lyon, of Albany, N. Y.; Charles D. Haines and T. Floyd Woodworth, of Kinderhook, and Frank H. Skeele, C. H. Sewall and Daniel G. Thompson, of New York. The office is at 111 Broadway, New York City.

Niagara Junction.—The following officers have been elected: Edward D. Adams, President; Francis Lynde Stetson and Edward A. Wickes, Vice-President, and W. B. Ranbine, Secretary and Treasurer; all of New York City, and George B. Burkank, Chief Engineer, Niagara Falls, N. Y. The New York office is at 35 Wall street.

Norfolk, Albemarle & Atlantic.—George R. Howell has been elected Vice-President of this company, with office at No. 44 Broadway, New York.

Northern Pacific.—W. S. Becker has been appointed Assistant Superintendent Manitoba Division, with headquarters at East Grand Forks, N. D., vice D. C. Horn.

Ottawa & Parry Sound.—The following directors were elected last week: J. R. Booth, C. McLachlan, C. Mohr, W. Anderson, C. J. Booth, N. Mackintosch and J. F. Booth, with J. R. Booth, President, and C. McLachlan, Vice-President.

Pacific (Nebraska).—At Hastings, Neb., June 7, at the annual meeting, the following directors were elected: Edwin Gould, New York; C. M. Rathburn, Atchison, Kan.; H. B. Howe, Auburn, Neb.; W. P. McCreary, Hastings; J. W. Wagoner, Atchison; S. H. H. Clark, Omaha, and E. G. Merriam, St. Louis.

Pennsylvania.—J. G. Stewart has been made Master Mechanic of the new shops of the Pennsylvania at Walls, Pa.

Portage Creek & Rich Valley.—The following are the directors of this new Pennsylvania company: B. H. Parkhurst, Elkland, Pa., President: G. C. Farnsworth, J. C. French and M. S. Fitzpatrick, Olean, N. Y.; J. R. Draney, Bradford, Pa.; C. L. Peck, Coudersport, Pa., and Charles S. Briggs, Kealting, Summit, Pa.

Queen Anne & Kent.—The stockholders met in Centreville, Md., June 1, and elected the following board of directors: Benjamin T. Biggs, G. B. Roberts, T. M. Parrott, M. Riebenack, Frank D. Howell, J. H. Du Barry and Richard D. Barclay. Mr. Biggs was elected President; Robert H. Groff, Secretary, and Robt. W. Smith, Treasurer.

St. Louis, Alton & Terre Haute.—At the annual meeting of the company the stockholders elected four directors of the third class as follows: Judge Levi Davis, Alton, Ill.; Edward Abend, Bellville; J. Eads, Paris, Ill.; H. H. Beach, Litchfield, Ill. The new board organized by electing the following officers: Geo. Foster Peabody, of New York, Chairman of the Board; George W. Parker, President and General Manager; Edward F. Leonard, Secretary; Henry Crosby Assistant Secretary; Henry T. Nash, Auditor; George W. Parker, Treasurer.

Savannah, Jacksonville & Gulf.—Gustave Thuiller, Paris, France; William S. Trimble, Atlanta; Samuel R. Pyles, Ocala; John A. Bishop, Clear Water Harbor, Fla., and Herbert A. Bishop, Jacksonville, Fla., are the incorporators of this company recently chortered in Florida to build through the state to Hillsborough County.

Texas & Pacific.—J. B. Paul has been appointed Superintendent of the Rio Grande Division of this road, with office at Big Springs, Tex.

W. W. Campbell, late of the Missouri, Kansas & Texas, has been appointed General Baggage Master of this road, and that office will be moved from Marshall to Dallas, Tex.

Toledo, Ann Arbor & North Michigan.—A. Ward has been appointed Division Superintendent, with headquarters at Frankfort, Mich.

Winona & Southwestern.—The company held its annual meeting last week. The following were elected directors for three years: Charles Horton, W. H. Laird, Andrew Hamilton and V. Simpson. The election of officers was postponed.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Atlantic Coast Line.—The Washington branch of the Wilmington & Weldon is now in operation. It is 24 miles long, extending from a connection with the Scotland Neck branch, near Greenville, east along the Pamlico River to Washington, N. C.

Baltimore Belt.—The May report of the tunnel contractors, submitted to the engineer in charge, shows that the total work completed on the tunnel is 5,098 ft. From the German Street shaft 2,954 ft. have been completed; from Madison Street, 1,091 ft., and from Preston Street, 1,053 ft. The work for May was 94 ft. at German Street, 124 ft. at Madison, and 55 ft. at Preston. From the north heading at Franklin Street to the south heading at Madison the work of 377 ft. still remains to be finished, and from the north heading at Madison Street to the south heading at Preston Street, 539 ft.

Bellaire, Zanesville & Cincinnati.—It is reported that this company contemplates widening the gauge from narrow to standard and an extension of the line west.

Boston & Albany (Ga).—The organization of this company, which was chartered by the Georgia Legislature in October, 1891, was completed at Boston, Ga., last week. It is reported that over $50,000 of the capital stock has been so far subscribed. The new road is to extend from Boston, on the Savannah, Florida & Western in the southern part of the state, northwesterly toward Albany, passing through rich farming and timber lands.

Calgary & Edmonton.—The grading on the southern extension to Fort McLeod, Alberta, is reported to be completed for the entire distance, with the exception of eight miles. The rails were laid last January for over 50 miles south of Calgary, and the tracklaying will be resumed by June 15 south of High River, and will be pushed through until the rails reach Fort McLeod, 110 miles south of Calgary.

Cherry Run & Potomac Valley.—This road was chartered in West Virginia last week to build a line from Harper's Ferry to Cherry Run, on the Baltimore & Ohio, in Morgan County, W. Va., through the counties of Jefferson, Morgan and Berkely. The principal office will be at Harper's Ferry, W. Va. The subscribed cap-

ital is $200,000. The incorporators are Thomas M. King and E. J. D. Cross, of Baltimore, Md., and M. T. Ingless, T. E. Auld and G. W. Sautman, of Martinsburg, W. Va.

Chicago, Evansville & Southern.—Press dispatches state that this company was organized at Evansville, Ind., on June 3, with a capital stock of $50,000, and that Dr. A. M. Owen was elected President. It is added that the new road will parallel the Evansville & Terre Haute, and that the Chicago & Eastern Illinois is interested in the new project to a considerable extent.

Clarksville Mineral.—The balance of the work on this line near Marion in Tennessee will be completed in a few weeks. The gap now being built is a little over seven miles long, between Marion and Van Leer station. The contract for this work was let several weeks ago to Joseph Coyne & Bro., of Marion. The Lousville & Nashville, which is to build the branch, has asked for the payment of the $25,000 subscription voted by Clarksville, Tenn.

Central of Georgia.—President Comer has filed a bill in the United States Court at Macon, Ga., asking for the appointment of a receiver for the Richmond & Danville on the ground that the defendant company is indebted to the Central in the sum of $2,459,670, and that it is insolvent. It is also claimed that the operation of the plaintiff's road has resulted in profit to the Richmond & Danville, but that by failure to make payments when due to the Central Co., and to pay dividends on its stock, the Richmond & Danville had damaged the interests of the Central. Judge Speer granted an order for a hearing on the application on June 17, at Macon. President Oakman says he has no fear of the receivership being granted, because the Richmond & Danville is entirely solvent.

Clearfield & Mahoning.—The company was incorporated in Pennsylvania last week to build a road to extend from a point on the Buffalo, Rochester & Pittsburgh, near Jefferson Line, Clearfield County, Pa., to a connection with the Beech Creek road near Clearfield, Pa. The length of the line is to be 27 miles, and the capital stock is $50,000, of which $20,000 has been paid in. J. M. Grosch, of Ridgway, Pa., is President.

Cleveland, Wooster & Muskingum.—The Baltimore & Ohio has formally assumed the operation of this line which extends from Lodi south to Wooster, O., 18 miles. The line was built last year under an agreement with the Baltimore & Ohio, and has been in operation since January, though no formal transfer has been made.

Columbus Terminal & Belt.—This company filed a charter in Ohio last week. The capital stock is $50,000.

Consolidated Terminal Co. of Kansas City.—Work has just begun on about two miles of extension of the Suburban Belt line through Kansas City to the stock yards district of the city.

Delaware.—A charter was granted in Pennsylvania last week to this company, with a capital of $51,000. The road will be eight and a half miles long, from Darby, in Delaware County, thence along the public road to and through Chester. Edward W. Patton, of Philadelphia, is President.

Findlay, Ft. Wayne & Western.—If a straight line and level grades, with cheap fuel, are the elements of a perfect railroad, the projectors of the old "American Midland" came pretty near that ideal in their scheme for the Ohio division of that road projected as near as may be along the 41st parallel. Unfortunately for that enterprise it did not secure the support of capital, nor did its successor, the New York, Mahoning & Western, which did a little work. The idea of the road was too promising to be abandoned, so out of the old corporations has arisen the present company which has undertaken to build between Findlay, O., and Ft. Wayne, Ind., a distance of about 80 miles. There seems now to be little doubt of the early completion of this section. The work is being built in a first-class manner, equal to the best roads of the middle States, with splendid gravel ballast, wide bermes and ditches. About two thirds of the track is ballasted up to standard on which a "mile a minute" has been frequently run. The rails weigh 60 and 65 lbs. The alignment of this division is remarkable, with but few curves, and none over 20 minutes, and a tangent of 46 miles in a single stretch. The maximum grade is 15⅝ ft. to the mile. Such a piece of road with fuel not exceeding 2¼ a ton, in the

heart of the country, extending nearly due East and West, is likely to have an important influence, particularly as its extension from either end promises the maintenance of the same grade and alignment. The company is now operating 45 miles of road west of Findlay, with stations every five miles. The track is laid for 52 miles to Mackinaw, and is now being laid toward Fort Wayne, which will probably be reached in September. The grading is finished to within 12 miles of that town. There will be only three iron bridges on the line, and these have been designed by A. P. Boller, of 71 Broadway, New York. The masonry abutments have been partly completed and temporary spans have been erected. The present traffic meets the fixed charges and is constantly increasing. It is largely glass, oil, timber, cattle and farming products. The Fort Wayne extension will extend through 20 miles of timber and one tract of 11 miles of virgin timber. At Crawfordsville the company owns large gravel beds.

Florence, Cripple Creek & State Line.—The locating survey recently begun north of Florence, Col., has been completed to Cripple Creek and Fremont, Col., 35 miles. Speaking of a report that arrangements has been made to begin grading on the line a railroad man, familiar with the country, says: "The line as projected would cost ten times as much as the capital stock of the company. The route surveyed by the Colorado Midland is 14 to 18 miles long, and it is estimated that the cost of building, omitting altogether the cost of transportation of men and supplies from Denver and Pueblo, would reach $500,000. Florence has an altitude of about 4,000 ft., while Cripple Creek stands at an altitude of 9,000, making a four per cent. grade in at least 25 miles of the route. The probabilities are that the State Line road will remain where it is—on paper."

Great Northern.—The tracklaying, which has been progressing at the rate of over three miles a day west of the Pend d'Orielle River, was completed into Spokane, Wash., June 1. The work between Spokane and the Columbia River is rapidly nearing completion. A. F. Whitcomb, division engineer in charge, says that 25 per cent. of the grading is now completed, and that in two weeks more fully half the grading will be done. Within a month the grading will be complete and ready for the tracklaying, with the exception of the bridges. The work is being pushed all along the line, on both sides of the Cascade Mountains.

The grading on the western end of the extension in the Puget Sound country has been completed from Snohmoish to Lowell, Wash., and has been begun west of the latter town toward the coast.

There are now between 5,000 and 6,000 men on the work. Contracts covering the remaining portion of the Pacific extension are let as follows: From Spokane to the Summit of the Cascade Range to Shepard, Siems & Co., of St. Paul; and from the summit of the Cascade Range to Puget Sound, to Shepard, Henry & Co., of Seattle, Wash. So far as the line has been completed, there is one iron bridge over the Pend d'Oreille River, in Idaho. This bridge consists of two steel through spans, one 300 ft. and the other 180 ft. in length.

Gurleys & Paint Rock Valley.—Grading and bridging on this road is progressing finely, and the first five miles from Gurleys, Ala., will be finished by June 20, when tracklaying will begin. The road is to extend from Fort Deposit, on the Tennessee River, to Winchester, Tenn., passing through large bodies of coal, iron and timber lands. Allen, Mosley & Co., of Rocky Mount, Va., are the principal contractors, and by the terms of their contract they are to finish the first 30 miles by Dec. 1 next, and the whole line by Dec. 1, 1893. Samuel J. Wheatcroft, of Birmingham, Ala., is Chief Engineer, and W. H. Calhoun, of Gurleys, Ala., is engineer in charge of location and construction.

Houston Belt.—Contractors have submitted bids for building the first 10 miles of this belt line at Houston, Tex., and the officers state that the contract for grading that much of the road will be made in a few weeks.

Huntington & Big Sandy.—This road is now so nearly completed that regular trains are running from Huntington to Ceredo, W. Va. The work is all done except about an eighth of a mile, concerning which there is a dispute as to the right of way. The Norfold & Western tracks are completed through that small distance, and the Huntington & Big Sandy is using that much of the latter road until the difficulty can be adjusted. Before June 15 it is the intention to have 10 trains daily between the two towns.

Huntingdon & Broad Top.—It is stated that the company is making arrangements to extend several of the branches leading to the coal fields along the line of the road, and the work may begin shortly.

Illinois, Indiana & Michigan.—Articles of incorporation of this company were filed at Indianapolis last week, the capital stock being $50,000. It is understood that the new company has been organized to build a line from the northern terminus of the Chicago & West Michigan at New Buffalo, along the sonth shore of Lake Michigan through Michigan City, Ind., and westerly toward Chicago to connect with one of the roads entering that city, so as to give the Chicago & West Michigan road a Chicago connection.

Indiana, Illinois & Iowa.—New surveys are now being made for the long proposed extension east of Knox to Plymouth, Ind., a distance of about 15 miles. It is understood that when the engineers reach the latter point the surveys will be continued northeasterly through Bremen to Goshen, Ind., where it is proposed to connect with the Chicago extension of the Wabash now being built.

Jacksonville Southeastern.—The proposition of the company for right of way through Galesburg, Ill., and station grounds, has been accepted by the city, and a committee has been appointed to secure subscriptions. The line proposed through Galesburg is the extension of the Chicago, Peoria & St. Louis to Rock Island, Ill., which was surveyed last fall.

Kanawha & Michigan.—The location for the extension of the Gauley River to connect with the Chesapeake & Ohio is now practically completed, as already reported. The line will be about 30 miles long and the route is from Malden, W. Va., following the east bank of the Great Kanawha River to the mouth of the Gauley River. The contractors are J. A. Casement & Co., of Painesville, O., and the work is to be completed about Nov. 1 next.

Manistee & Northeastern.—The Traverse City extension now being built begins at the village of Lake Ann, Benzie County, Mich., and extends in a northeasterly direction through Grand Traverse County and Leelanaw County, to the south end of Carp Lake, thence easterly and southeasterly to Trasverse City, Mich., the total length of the extension being 19 miles. The grading for this extension has been completed and the rails were laid on June 1 to within six miles of Traverse City. No work is let by contract. The number of men at present employed by the company on construction is 150. The number of miles of track laid since Jan. 1 to June 1 on the main line is eight miles and on branches two miles. The maximum grades on the extension do not exceed 47 ft. to the mile, and the maximum curves outside of Traverse City do not exceed 124 degrees. There are no bridges of importance upon the extension. The road will be completed to Traverse City during the month of June and a regular passenger and freight service established at once. The company contemplates the erection of a handsome passenger station at Traverse City this summer, which will probably be built by contract. J. J. Hubbell, of Manistee, is Chief Engineer.

Missouri, Kansas & Texas.—An amendment to the charter of the company has been filed in the State Department at Austin, Tex., authorizing the following extensions: From Sherman to Fort Worth, 80 miles; from Henrietta to Wichita Falls, 18 miles; from Waxahachie to Trinity, 140 miles; from Colmesneil to Sabine River, 40 miles; from Lockhart to Smithville, 80 miles, and from Coupland to Austin, 26 miles. The line from Waxahachie is southeast to Trinity, and will connect with the line operated between Trinity and Colmesneil, which is now without connection with other parts of the system. The line to the Sabine River is a western extension of this line. The line from Smithville is west, and will give the road between San Marcos and Lockhart, 16 miles, a connection with the main line at Smithville. The line from Coupland is an extension into Austin from the main line. Sherman, from which an extension is proposed to Fort Worth, is 11 miles south of Denison, and the company's main line at present runs through Denison and Fort Worth. If a new line is built to Fort Worth, it will be east of the main line, and parallel to it. The extension from Henrietta is west to Wichita Falls, but the main line of the Fort Worth & Denver City now extends through both of those towns.

The Board of Trade of Austin, Tex., has appointed a committee to raise by subscription a bonus of $50,000 to secure land for station grounds in the city for this company and right of way for the extension to Austin.

Montana Central.—Messrs. Foley Brothers & Guthrie, of St. Paul, have completed building three spur tracks to the Mountain View, Pennsylvania and Leonard mines of the Boston & Montana Co., at Butte, Mont. The three spurs aggregate seven miles of track, and the work of construction was very heavy.

Nashville, Chattanooga & St. Louis.—The engineer have just completed a new survey through Huntsville Ala., and south to a point on the Tennessee River near Hobbs Island, a distance of about 14 miles. The new line will be part of the Tennessee & Coosa division, and it is expected that construction will begin early in July. A steamer line will be operated on the Tennessee River from Hobbs Island to Guntersville, where connection will be made with the southern section of the Tennessee & Coosa division. The citizens of Huntsville, Ala., have agreed to secure right of way through the city to the Tennessee River and to donate about 50 acres of land near the city.

The engineers have just begun a survey from the terminus of the Nashville & Tuscaloosa road, or the Centreville branch, as it is now called, to the mines of the Southern Iron Co., in Lewis County, Tenn., about two miles south of the present terminus of the branch.

New York, New Haven & Hartford.—The company has had surveys made recently for a proposed branch from Woodmont on the main line to a point on the Naugatuck division near Derby, Conn. The new line will be about 5½ miles long and will serve as a cut-off from the Naugatuck Division to New Haven. The present direct line between New Haven and Derby is the old New Haven & Derby, now controlled by the Housatonic. No report of the surveys has yet been made to the directors, and it will not be decided whether or not the line will be built until after a meeting of the directors.

New York, New Jersey & Eastern.—This company filed articles of incorporation in New York this week. It has a capital of $100,000, and proposes to have five miles of road in New York and about one mile in New Jersey. It is to be an underground, standard-gauge tunnel railroad, and is to start from some point in Brooklyn near the junction of Flatbush and Atlantic avenues, underground, and under the East River to New York, and across and under the city and under the Hudson River to New Jersey. The road is to have branch lines, one of which is to run to same point near the Battery in New York. The directors are connected with the Long Island road, and the project is one proposed by Austin Corbin.

New York & South Beach.—At the annual meeting this week at 111 Broadway, New York City, it was voted to issue six per cent. bonds to the amount of $150,000 to build and equip the road. The line is to be standard gauge, connecting with the Staten Island Rapid Transit and extending along the shore of South Beach for a distance of three miles. The motive power will be steam or electricity.

New Roads.—The Senate Committee on Indian Affairs has reported to the Senate the bill granting the right of way to the Midland Pacific through the Crow Creek Indian Reservation, in the state of South Dakota. The bill granting the right of way to the Watertown, Sioux City & Duluth through the Sisseton and Wahpeton reservations has also been reported.

Thomas McMaster, of Ludington, Mich., is the projector of a line to extend from Big Rapids westerly to Ludington, on Lake Michigan. It is proposed to organize a local company to construct the line.

H. W. Warren, of Rochester, N. Y., and other Eastern capitalists, who recently purchased the Hillside mines in Yavapai County, Ariz., will, it is stated, build a line about 20 miles long to connect the mines with the Santa Fe, Prescott & Phœnix Railroad.

Alexander Murdoch, of Philadelphia, has begun a survey for a new road about 25 miles long from State Line, Pa., on the Cumberland Valley road, west to Hancock, Md., on the Cumberland Canal. It is reported that the new line is intended to connect the Cumberland Valley with the West Virginia & Pittsburgh. The surveys for the Baltimore & Cumberland, an extension of the latter line to Baltimore, were recently completed through Hancock.

Niagara Junctions.—The surveys are well advanced for this road, and the intention is to have the building of the road commenced at once. The work will be very easy. The line will be five or six miles in length, and is to be built by the Cataract Construction Co., which is building the tunnel at Niagara Falls. The route is entirely within the city limits of Niagara Falls.

Northern Pacific.—The construction work on the Gray's Harbor line is practically finished. Train surveys will soon be inaugurated west of Monte Seno to South Aberdeen, Wash., 14 miles on the south side of Gray's Harbor, and near the Pacific coast. The grading and tracklaying were completed in February, and since then the ballasting and erection of buildings on the western end have been in progress, and this work is now practically completed.

Norfolk & Western.—Last week a number of the officers of the company made a trip over that part of the Ohio River extension which is completed, for the purpose of accepting from the contractors the new stations. A general survey of the line was made, and the report is that all the work is progressing well and that the line will probably be completed on time. F. C. Hitchcock, resident engineer, was in Williamson last week and stated that the work was all well under way. At the Kenova end of the track the rails are laid to within eight miles of the large tunnel and the tracklayers are expected to reach that point by July 1. On the Elkhorn end, 50 miles of track has been laid and the work is progressing at the rate of about three-quarters of a mile a day. The two sections are expected to be joined about Oct. 1. Williamson is about the half way point, but as the grading above Hatfield Bend is the least advanced, it is likely the junction point will be above the Hatefield tunnel.

Ohio River.—Track laying on the extension through Huntington, W. Va., is rapidly progressing and the

junction at Tenth street, with the Huntington & Big Sandy, was made June 1. The iron work on the bridge at the Guyandotte River will commence at once. J. A. Hughes, of Ceredo, W. Va., is the contractor, and the Keystone Bridge Co. is building the bridge.

Ohio Valley.—The unfavorable weather has so delayed the construction of the line to Hopkinsville, Ky. that it is doubtful if it will be opened before Aug. 1, instead of in June as expected. The grading has been completed from Gracey near Princeton southeast to Hopkinsville, a distance of 10 miles, and the tracklaying has been commenced by the contractor, W. A. Shippey.

Osceola Lake & Wexford.—This company, whose incorporation in Michigan was noted last week, is to build a road to commence at Olga, Lake County, the terminus of a branch of the Grand Rapids & Indiana, and extending northerly through Wexford County toward the Manistee River. The company has been incorporated by W. F. Chittenden, of Cadillac, Mich., and others interested in the Chittenden Lumber Co.

Paducah, Tennessee & Alabama.—The contract for the extension south of Hollow Rock, to Lexington, Tenn., 30 miles, will be let June 15. The work has been fully described in these columns.

An election has been ordered to be held on July 2 to decide whether or not Henderson County shall take $25,000 stock for the southern extension from Hollow Rock, Tenn. The town of Lexington will vote for a subscription of $15,000 on June 28.

Pan-American.—Track laying has again been resumed on the graded road south of Victoria, Tex., and the officers state that this work will now go on uninterrupted until the track is laid to the Guadaloupe River, to which point the grading has been finished. J. H. Barrett, the contractor, has suspended the grading, and removed his outfit to Houston, but he states that the grading will probably be resumed in a short time.

Pennsylvania.—Notwithstanding the work on the Philadelphia & Bustleton branch from North Penn Junction to Bustleton, has been stopped pending legal proceedings, the engineers of the company are surveying the line from a point a little south of Bustleton to the Trenton "cut-off," a distance of about seven miles. Besides making this survey the company has in contemplation the survey of a line from Bustleton to a point near Tullytown. As soon as the preliminary injunction is removed the work on the Philadelphia & Bustleton line will be pushed rapidly to completion.

Condemnation proceedings have been begun to secure several acres of land at West Manayunk, Pa., on the Schuylkill River, for which the company is reported to have offered the owner $78,600. The property is needed in the improvements to be made to connect with the Pencoyd Iron Works. The plans for this work have now been completed. A branch road two or three miles long will be built to the bridge works, which will also serve to shorten the line to Manayunk, and the trestle across the tracks near West Laurel Hill will be replaced by a stone bridge to prepare for the heavy traffic expected.

Pittsburgh & Western.—The grading for the double track has been finished between Zelienople and McKimms, Pa., a distance of seven miles, and the work is now ready for the rails. This will complete 12 miles of double track west of Rock Point, Pa.

Portage Creek & Rich Valley.—This company was incorporated in Pennsylvania June 3. It proposes to build a road from Liberty Station, on Western New York & Pennsylvania road, in McKean County, to Keystone Junction, on the Keystone road, in Norwich Township, McKean County. The length of the road will be nine miles, capital stock being $90,000. The principal office will be at Elkland, Pa. B. H. Parkhurst, Elkland, Pa., is President.

Roanoke Belt.—Capt. Henry Davin, who has the contract to build this belt line around Roanoke for the Norfolk & Western, is pushing the work rapidly and expects to have all the track laid in a few weeks. About 150 men are at present working on the line.

St. Louis, Chicago & St. Paul.—Contracts have been let to Johnston Bros. & Fought, of St. Louis, for the extensions of this line, which is the successor of the St. Louis, Alton & Springfield, from Alton to East St. Louis, about 20 miles, and to Coster, near Springfield, Ill.

San Antonio & Aransas Pass.—General Superintendent George L. Sands, in an interview at Houston, Tex., regarding the proposed extensions of this road, is reported to have said that grading was about to begin on the extension from Comfort north to Fredricksburg, Tex., when the disagreements between the receivers were brought into court. This matter he expects to be soon adjusted, and then construction work will probably be resumed. Some work has already been done on the line north of Comfort toward Fredricksburg, which is about 20 miles long. It has been surveyed to the iron mines at Llano.

Shuswap & Okanagan.—The Canadian Pacific will assume operation of this road about June 15. It is now completed from Sicamous, B. C., on the main line south to Okanagan Lake, a distance of 51 miles. This is one of the most fertile districts in British Columbia and is already well settled. Okanagan Lake is over 100 miles in length and is connected with the Columbia River by Okanagan River.

Sioux City, Chicago & Baltimore.—The surveys southeast of Sioux City, Ia., through Woodbury County were completed across the Little Sioux River last week to Oto, a distance of 30 miles. This brings the survey within a few miles of the county line, but the engineers will probably continue the line northeast to Rockwell on the Des Moines, Northern & Western.

Union Pacific.—Work has been commenced on the Gray Creek extension at Bashore, a few miles east of Trinidad, Col., on the main line. The road will be built three miles to the Gray Creek coal mines. Division Engineer Ashton has just finished the surveys.

Weatherford, Mineral Wells & Northwestern.—Graham, Tex., has offered the railroad $25,000, right of way and station grounds, to extend its line from Mineral Wells north to that town, a distance of 40 miles. The officers are considering the proposition, but it is hardly likely that the offer will be accepted under existing circumstances.

Winnipeg & Hudson Bay.—Hugh Sutherland, President of this company, who has been in London for several months, has cabled the directors at Winnipeg that he has succeeded in financing the scheme in London. It is added that contractors are now ready to begin operations at once.

Winslow & Richards.—The charters of this company and the Richland & Petersburgh were filed in Michigan last week, the capital of the former company being $100,000, and of the latter company $230,000. The incorporators are W. J. Sewell, President of the West Jersey; J. N. Du Barry, J. P. Green, and other directors of the Pennsylvania. The new company has been organized to operate the Philadelphia & Seashore, recently sold at foreclosure. The new charters cover the divisions of that road already completed, from its northern terminus at Winslow to Petersburgh, a few miles south of Tuckahoe.

GENERAL RAILROAD NEWS.

Central of Georgia—S. M. Williams, formerly auditor, and now vice-president of the Central of Georgia, has completed an examination of the accounts between the Central of Georgia, and Richmond & Danville during the lease, at the request of the latter company. He reports that on May 31 $2,316,906 was due from the Central of Georgia, which includes over $879,000 of indebtedness incurred by the Central of Georgia prior to the lease and not shown by its balance sheet on June 1, 1891.

Of this amount claimed as due to the Richmond & Danville, $1,535,808, which was incurred in the operation of the Central and the payment of its debts, "the receivers," as Mr. Williams expresses it "repudiate as a charge against their trust, notwithstanding that they have taken possession of all the property and assets of the Central Railroad Company including the balance due the Richmond & Danville on account of the operations of the Central lines of every nature whatsoever."

Chicago & Eastern Illinois.—At the annual meeting of the stockholders at Chicago last week a lease of the Chicago & Indiana Coal Railroad in perpetuity was ratified. Under the terms of the lease the bonds of that company will be formally guaranteed by the Chicago & Eastern Illinois. It was also decided that the stock of the Chicago & Indiana Coal road, all of which is held by the Chicago & Eastern Illinois, it having issued its own stock against the same, shall be turned over to a trust company to be held in trust for the shareholders of the lessee company.

Chicago & Northwestern.—The company reports for the year ending May 31:

	1892.	1891.	1890.
Gross earnings	$31,394,029	$27,810,710	$27,164,837
Oper. expen. and charges	26,479,406	24,134,609	22 891,302
Balance	$4,914,623	$3,676.101	$4,273,535
Div. & sinking fund	3,673,035	3 445,804	3,647,549
Surplus	$1,241,588	$230,297	$625,986
Sur. Western lines	41,759	19,540	112,456
Total surplus	$1,286,347	$249,837	$738,442

Louisville, New Orleans & Texas.—A special meeting of the stockholders of the Illinois Central will be held at Chicago June 18, to take action on a proposition to approve of the purchase of securities of this company. The company operates 799 miles of road, of which 75 miles are narrow gauge. The great majority of the securities can now be bought on a basis of paying for all such securities $5,000,000 in cash and $20,000,000 in Illinois Central 4 per cent. bonds. The capital stock of the company is $5,000,000 and the bonds outstanding amount to $35,216,000. The lease is discussed in another column.

Morristown & Cumberland Gap.—Frank J. Hoyle was this week appointed Receiver of the road, through orders of Judge Key, of the United States Circuit Court at Knoxville. A bill was filed by John Coleman, of Louisville, Ky., against the railroad company, and Allison, Shafer & Co., contractors, asking for the appointment of a Receiver. Mr. Hoyle was formerly General Manager of the road.

New York Central & Hudson River.—The gross earnings for May, 1892, were $3,643,403 as compared with earnings of $3,474,437 in 1891, an increase of $168,966 for the month.

New York, Providence & Boston.—A mortgage for about $1,000,000 was recorded at Providence, R. I., June 7. These bonds are part of an issue for $4,000,000 which the General Assembly authorized the company to issue before the recent lease to the New York, New Haven & Hartford, and the proceeds are to be used for construction work and for taking up stock of the Providence & Stonington Steamship Co.

Northern Pacific.—The gross earnings, for April including the Wisconsin Central Lines, were, in 1832, $2,123,744, and in 1891, $2,293,476, the decrease being $169,732. The mileage operated was 5,211 miles in 1892 and 5,121 miles in the previous year.

Philadelphia & Seashore.—The Philadelphia & Seashore, recently purchased by William J. Sewell, President of the West Jersey, has been sold to the Winslow & Richland Railroad and Richland & Petersburg Railroad from Winslow to Sea Isle City, N. J., the reported consideration being $653,500.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, June 8, 1892.

The Chicago & Eastern Illinois has notified Joint Agent Brown, of the Chicago and St. Louis Association, that unless it is recognized as a Chicago-St. Louis line and accorded proportional rates on business destined to the Missouri River and beyond, it will put in effect rates between Chicago and East St Louis as follows:

1	2	3	4	5	6
20	20	10	5	5	5

These rates would have the effect of reducing the local rates between Chicago and St. Louis 27 cents on first-class and correspondingly on other classes. The Chicago & Eastern Illinois and its connections, the Cleveland, Cincinnati, Chicago & St. Louis and the Toledo, St. Louis & Kansas City, claim to form a legitimate Chicago-St. Louis line and formerly were allowed to participate in a proportional rate on this business of 37½ cents (first class) under the operation of what was known as "S. P. Brown's division sheet No. 64." In October last one of the members of the Western Traffic Association complained to the Commissioners that this sheet was likely to cause irregularities, as business was billed locally to St. Louis at these proportional rates, and the lines west of there accepted as their proportion the balance of the through rate. After a hearing the Commissioners ordered their lines to abolish the tariff, which was done. Since that time the Chicago & Eastern Illinois, not being a party to the Chicago-Missouri River rate, has been obliged to use the local rates to the Mississippi River. What it is evidently after is to be allowed to apply the Chicago-Missouri River rates locally from its stations, which it is not able to do as the territory is now arranged.

The Western Passenger Association has elected for its chairman Mr. J. R. Buchanan, General Passenger and Ticket Agent of the Fremont, Elkhorn & Missouri Valley, and Sioux City & Pacific lines. He has asked for time to consider the offer, before announcing his acceptance or rejection of it.

The lines parties to the agreement for the distribution of passenger traffic between Chicago and St. Paul have voted to discontinue the agreement, owing to the withdrawl of the Albert Lea line and to some dissatisfaction which was expressed by some of the other lines. The plan has been in operation for some 18 months and has resulted in securing a more stable condition of rates in the Northwest than has prevailed for several years, and by many of the lines its abandonment is regarded as unfortunate.

The Southwestern Railway & Steamship Association took an adjournment to St. Louis without settling upon any agreement or plan for the future continuation of the association. Some of the lines were in favor of retaining the present form of agreement and re-electing the chairman, but a majority of those present favored the new plan, which places the affairs of the association under the control of an executive committee of three. The Missouri, Kansas & Texas was not in attendance upon the meeting and did not give any intimation whether it would accept the new plan or not. It is known that Vice-President Waldo is not in favor of continuing the present agreement, and it is quite probable that he will not be in favor of the proposed new agreement, preferring to submit a plan of his own.

The Chicago scalpers have adopted another set of resolutions reaffirming the boycott against the Chicago, Burlington & Quincy and the Chicago, Milwaukee & St. Paul. The boycotted lines do not appear to be suffering greatly in consequence of the boycott, however.

Rumors are current that cuts in freight rates are being freely made from the East to the Missouri River, and indications point strongly toward the Missouri Pacific as the guilty party.

Lake rates are steady at 1½ cents for wheat and 1¼ cents for corn to Buffalo.

Charges are being freely made that there is a big cut being made on Minneapolis passenger business, and several roads claim to know that rates of $10 from Cleveland and $13 from Cincinnati have been made for the round trip, but they are unable to locate the cut either east or west of Chicago.

Traffic Notes.

The agent of the Interstate Commerce Commission has secured the indictment of a shipper at Omaha for under-billing freight.

The bill, which has been pending in the Massachussets Legislature for some time, prescribing a rate of two cents a mile for local passenger fares on most of the roads of the State, has finally been rejected in the House.

The Metropolitan Trust Company, of New York, trustee for the bondholders of the Houston & Texas Central, has filed suit in the Federal Court against the Texas Railroad Commission, at Austin, Tex., to set aside the tariffs issued by the Commission.

A bill has been introduced in the lower house of Congress by Representative Meredith, of Virginia, to change the time limit in section 4,386 of the Revised Statutes, which regulates the time in which animals may be continuously confined in cars without food, water or rest. The bill makes the maximum time 42 hours, which is 14 hours longer than the limit in the law now in force.

The suit brought by the District Attorney in the United States Court at Leavenworth, Kan., some weeks ago, to dissolve the Trans-Missouri Freight Association, on the ground that it existed in violation of the Anti-Trust Law, has fallen through. A despatch from Leavenworth June 7, states that the District Attorney refused or failed to make an argument, and the Judge dismissed the case.

The Long Island Railroad Company has made a contract with a new carriage company to furnish conveyances for passengers arriving at its stations in Brooklyn and New York City, and notifies passengers that agents along the line of the road will telegraph orders for these carriages without charge. The President of the carriage company is Vice-President Norton of the railroad company.

The refusal of the Southern Pacific to adopt the reduced freight rates ordered by the Railroad Commissioners of Oregon, some months ago, was followed by an agreement to submit the matter to a referee, who should decide what rates were to be adopted. The referee has now filed his report, which, in general, sustains the Commissioners. He recommends that the rate ordered by the board for blinds, doors, sashes, etc., be not allowed. Except in this instance, he finds that the plaintiff is entitled to the decree and that the rates shall be applicable from and after July 2. As to the Portland & Willamette Valley Railroad, he recommends that the complaint be dismissed.

The Boston Chamber of Commerce has renewed its complaint against the Boston & Albany and the Trunk lines concerning the rates on grain, flour, etc., from the West to Boston. These rates, except for goods to be exported, have for a long time been five cents per 100 lbs. higher than on similar goods to New York, and the Interstate Commerce Commission, deciding a complaint presented a year or two ago, has lately ordered this difference to be reduced, and the differential to be computed on a percentage basis, according to mileage. The complainants now urge that a large portion of the shipments received at New York are carried at eight cents less than Boston rates, instead of five cents less, this claim being based on the fact that a portion of the New York rate, viz.: three cents per 100 lbs., goes for lighterage charges, and is deducted from the freight bill in cases where the consignee takes the freight directly from the cars, as, for instance, in Jersey City.

Eastbound Freight Shipments.

Eastbound shipments last week amounted to 49,006 tons, against 53,718 tons for the preceding week, a decrease of 4,712 tons, and against 34,340 tons for the corresponding period last year, an increase of 14,666 tons.